CHEMICAL & METALLURGICAL ENGINEERING

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CHEMICAL & METALLURGICAL ENGINEERING

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Editor

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The Future Of Niagara

NIAGARA'S torrent is estimated to have 6,000,000 available horsepower, of which at the present time 400,000 is developed on the American side—and a little more than double that amount on the Canadian side. With what difficulties, mechanical, electrical and social or psychological, this development was beset it is difficult to remember. We can recall vividly drawings of an Indian worshiping the Falls and then of his ghost returning and throwing up his hands in horror at the line of factory buildings along the cliff. For years it was our impression that the row of buildings was the top of the former falls. Doubtless, too, when the time comes to take more water from Niagara the same hullabaloo will be raised. "What! Spoil Nature's masterpiece for some grimy industry!"

So far as we have been able to discover there never has been any thought of eliminating Niagara as a spectacle. But sentimentalists are prone to forget the other side of the ledger in their zeal to prevent the loss of a single drop of water from the magnificent cascade. They forget 2,000,000 people from Erie to Syracuse that daily receive light and power from Niagara in their homes, in their factories, on their farms. Two million people whose lives are made more comfortable because of this diversion of water! In addition, remember that many industries that give to the world commodities unique in their usefulness were born of Niagara's power and would die without it.

Let us consider still another side of the question. Five per cent of the water of Niagara flows over the American falls and in the opinion of many, probably a majority, these falls are more beautiful than the Canadian falls. They are always visible, whereas the mist from the vast volume of water that flows over the Canadian falls frequently obscures them. More and more the water is tending to flow over the center of the horseshoe and to eat it away more rapidly. In time the already distorted horseshoe will become a much smaller horseshoe in the center of the present one over which an increasingly large per cent of the water will flow. Nature is already beginning to spoil her own handiwork.

A remarkable plan has been suggested that will make the sentimentalist howl, but in view of the above discussion there is reason to believe that the plan is a constructive solution to the Niagara problem. Briefly, it is this: Construct engineering works in the bed of the river above the Canadian falls so as to distribute the water evenly across the surface and divert for power by canals all water in excess of that needed to produce the effect of the American falls throughout the whole face of the Canadian falls. This would increase greatly the power that could be used and if, as has been estimated, 60 per cent of the water could be diverted, it would give roughly 3,500,000 total horsepower. If we now translate this into coal that would have to be burned in an efficient modern steam plant, we should save approximately 7,000,000 tons of coal per year.

An ingenious model of this project has been constructed to scale and the effect of the diminished and distributed flow has been studied and can be demonstrated to the doubting Thomases. Does it not seem wise to formulate such international agreements as may be necessary and take advantage of the great benefits that are offered? It is the part of national economy of resources, of wisdom, of common sense and even of the desire to preserve (not destroy) the great asset of Niagara's beauty. As engineers we should lead such a project and lend to it our approval, our influence and our energy.

Now Is the Time To Get Your Coal

THE recently issued report of the committee on storage of coal of the American Engineering Council serves again to call attention to the advantages that attend the early purchase and consequent storage of the winter's supply of coal. The evident fact that there are many small users of coal who have no possible facilities for such storage, coupled with the fact that such consumers as railroads and public utilities must have their supplies regularly throughout the year, causes a great burden to be placed on the transportation system of the country in the fall and winter months. Anything that industrial users can do to keep from making additions to this necessarily great amount of haulage will be a help to the country as a whole. Also, the mines have not any too much coal storage space—so that, if most of the year's supply of coal is to be shipped in a few months, it cannot be mined over a much longer period. Hence the purchase of the coal supply for industry during the summer months, prior to the peak demand, means an extension of mining activities over a greater period of the year, more stable conditions in the mining industry, better employment conditions for mines, and cheaper coal for all.

Important as these results flowing from the early purchase and consequent storage of the winter's coal supply are to the country at large and to the individual industrialist, there are certain other benefits accruing to those who follow this course of action that should prove decisive factors. Almost yearly the heavy burden of haulage thrown upon our railroads in the late fall and early winter months disorganizes traffic to such an extent that the prompt receipt of coal shipments becomes a gamble, to say the least. This same period is also the period when rail and mine labor difficulties seem bound to crop up. If, then, the coal supply of any plant is to be assured, it becomes a necessity that this supply be on hand well in advance. The desire for sure, continuous operation and the resulting economy are factors that make it of prime importance for the industrial plant to purchase its coal early and store it.

It is undoubtedly true that the largest and the most efficient plants in the chemical engineering industries follow the course outlined above. However, there are many plants that do not as yet do so. We wish to point out to such plants that this current month of August presents their last opportunity of the year to take the prudent course. In September the great seasonal flow of coal will start. Immediately the price of coal will rise and congestion of railroads will commence. To these may be added labor troubles as a further obstacle. In view of these facts, a word to the wise—act now—should be sufficient.

King Grain Raises the Ante

THINGS are looking up. For one thing the grain markets have advanced spectacularly. It is estimated \$1,000,000,000 has been added to the value of our grain crops. The reason for the sudden change is the unfavorable outlook for the world's supply of cereals. Weather conditions appear to have restricted the yields in the grain-producing countries. The Department of Agriculture in the July report places the indicated production of corn at 2,515,000,000 bu. compared to 3,054,395,000 for 1923, according to the final estimate and further compared to 3,057,500,000 bu., the average of the past five years.

This increased price will make itself felt in many branches of industry. Foodstuffs, meats, hog products, and edible vegetable oils should show the effects first. In general it should prove to be a good thing as the farmers will undoubtedly get much of the benefit. Of course a price inflation beyond a point warranted by actual conditions leads invariably to curtailment in purchasing. The cotton market last year presents a recent confirmation of the principle.

Nevertheless in spite of gloomy possibilities the rise in grains seems to be an occasion for rejoicing even if or perhaps because the farm bloc had nothing to do with it.

Silicate of Soda As a Constituent of Soap

THE soap industry is particularly unfortunate in producing a commodity varying so widely in composition and properties that no adequate definition of a pure soap can well be advanced. Although the chemist may be satisfied in defining it as an alkali salt of a fatty acid, so few commercial grades of soap conform closely to this that for practical application, as in settling a legal dispute, it is nearly worthless. It is true that the public at large has been educated through national advertising campaigns to accept certain grades of soap as very nearly pure, but to the technical man it is obvious that hypothesis has been sold as fact. It is partly because the public does not actually know what it wants in the way of soaps that the industry has such a difficult task in selling many of its products.

Of the many materials falling outside the chemist's definition of soap that frequently enter the commercial product, silicate of soda is one of the best known. Technical arguments and court room disputes have thus far failed to establish whether silicate addition officially constitutes an adulteration. At the present time there are widely varying views on the merits of silicated soaps, in the minds of both producers and consumers. For that reason it is believed that James G. Vail's summary of the situation, appearing in this issue, will be valuable. After an extensive investigation, he presents here what appear to him to be the outstanding facts in the case.

That silicate imparts definite detergent properties when used in certain soaps appears to be a fixed fact. Whether or not silicate of itself is a soap is beside the point, although it is probably safe to assume that silicate as such is not soap in the sense attached by the chemist. As for detergency, possibly this compound acts as other mild alkalis, but from the soap maker's viewpoint it imparts other valuable properties to his product. Silicate addition renders the cake more resistant to deformation through aging even when the water content is initially high. It also lowers the tackiness of rosin soaps and in general adds gloss to the settled product. Being cheap and practically non-effective in harmfully changing the color of the product, two further appeals are made to the manufacturer.

At the hearings in the case of the Federal Trade Commission against the Procter & Gamble Co. held last year in New York, Earl P. Stevenson stated that addition of silicate up to 10 per cent might well improve the properties of a soap. This is in close accord with Mr. Vail's evidence. Since it has been shown that silicate does impart favorable characteristics in soaps to be used for fixed purposes, it seems unwise to condemn its addition on the ground that because it is unlike other ingredients, it is an adulterant. Its use, with discretion, appears to be justifiable as long as false claims are not made as to its virtues.

Educating an Intelligent Laity

THERE has been much discussion, highly desirable and highly intelligent, of the education of chemical engineers and of chemists. How shall universities best prepare these men for their professional work? Much good has already come out of the discussion and more will come. It has been commendable from the start.

But there is another phase of chemical teaching that is woefully neglected and miserably executed. After all, nearly every institution turns out a fairly presentable chemical engineer or chemist, but how about the man who does not go into chemistry, who never intends to go into it, but who would like to know what it is all about? He is the man who says, "oh, yes, chemistry! I remember H_2SO_4!" He is the average educated man who becomes an investor or an executive or just a plain intelligent citizen. We give him a course in chemistry designed to introduce the future chemist to his subject and to prepare him for advanced courses. We crowd it full of language, of vocabulary, of statistics, of detail. We confuse the neophyte, especially if he doesn't care particularly to master it, as he is not going on with the subject, and we give him nothing of the romance, of the thrill, of the vast significance of chemistry to everyday life and to the life of the nation. Chemistry means to him a vast labyrinth of signs and data. Is that the way to go about training an intelligent laity? Do we hope to have chemistry appreciated by the public with that sort of an introduction?

Can we find men in the profession itself who are not so steeped with vocabulary that they can't talk in understandable language? If we can, we should mark them and assign to them a post of honor of developing an intelligent and sympathetic laity, of interesting the

college man in chemistry, not to go on with it but to understand and appreciate it. Some colleges are alive to this situation and are already looking for such men (or women).

Let us pray that the day is rapidly passing when the man who is merely interested in the basis of our profession will encounter an orthodox chemical course at the outset that will forever dry the enthusiasm that prompted him to inquire.

A Challenge From the Worker In Education For Citizenship

"I VISITED the Latin department in a college and heard of Rome's ancient grandeur. 'They were builders,' I was told, 'they built concrete roads to the ends of the earth. But their soldiers brought back malarial fever from Africa and it destroyed the builders and their secret. Eighty years ago concrete was rediscovered.' 'Do you know how to make concrete?' I asked the students. 'I'll say we don't,' they answered. And that's how much good their Latin education had done them. The Mooseheart boy can build concrete roads and the motor trucks that travel on them. He can build his own house. He is taught civilization. We teach art too, but what is art without civilization. You can't eat pictures."

The quotations are from a remarkable book by a remarkable man. Secretary James J. Davis was an iron puddler and that's what he calls the story of his life. It is a thrilling story of the kind of success that is possible in this country, success brought about by diligence and honesty under the favorable conditions of our life. It is a story told without conceit but with an intense pride in his trade and in the knowledge that intelligent manual dexterity is the basis of civilization.

The last three chapters tell the story of Mooseheart School, a school created by some 500,000 of America's workers in the Loyal Order of Moose. Mooseheart is a school for orphans with 1,000 children of from one to 18 years and 115 mothers who went there with their children. It grew out of the heart-breaking experience often repeated in Davis' younger days of seeing a family broken up when the wage earner was killed. At Mooseheart the family is kept intact and an education guaranteed by "half a million foster fathers"—an education that rich men's sons cannot buy.

At eighteen the boy or girl is graduated from Mooseheart with a high-school education and at least one trade in which he or she can earn a splendid livelihood. The student can learn as many trades as he will and in addition he is thoroughly grounded in agriculture so that he can run a farm himself to better advantage than a worker who has grown up on the soil.

It is impossible in a few words to describe the Mooseheart idea and the spirit that created it and carries it on; but there is something substantial and reassuring in it. Instead of a thousand children (there are nearly twelve hundred at Mooseheart now) thrown by the death of their fathers on a community that is unwilling and unequipped to provide for them; each one is educated not only in the conventional subjects of school curricula but in agriculture, the basis of civilization and in one or more artisan trades that are essential to the modern social structure. Having watched the ineffectiveness of the average college man after graduation, the thought is irresistably borne in upon us that perhaps Mooseheart can give the schools and colleges of this country a new guiding star. In training for citizenship can there be anything more stabilizing than the confidence and pride that mastery of a trade gives to the young man or woman? How many college-trained men there are who have not wondered a little fearfully what they could do if things turned out badly for them. How many wives of college men, often themselves college trained, have peered anxiously into a possible future in which they would have to support their children? Let that nation beware if the builders, the "beaver men," diminish in number. Let it cast up a trial balance and discover whether handicraft is not only the basis of progressive civilization but of the balanced education of its citizens as well.

Paving the Way for a Museum of Engineering

WITH $1,000,000 already assured toward establishment of the National Museum of Engineering and Industry, a drive has been started to raise an additional $9,000,000 with which to complete the fund desired. Whether or not this amount can be raised appears problematical, although it would have the enthusiastic approval of all engineers.

It is proposed by this organization, headed by Dr. Elihu Thompson and including in its personnel such eminent men as Edward G. Acheson, Leo H. Baekeland, Edward Weston, Philip T. Dodge, Howard Elliot, Ira N. Hollis, Elmer A. Sperry and Worcester R. Warner, to erect a building in Washington in which to house the original models of early inventions and the records of constructive achievement of inventors and engineers in the development of transportation and industry.

At present the average layman has at best but a hazy and inaccurate knowledge of the engineer's job. The mysteries underlying his breakfast cereal or his felt hat pass unconsidered. Only by educating the public can the popular misconceptions about engineering and scientific work be transformed into intelligent understanding. It is to be hoped that the committee's effort will meet with success.

The Spirit Of Research

IT IS refreshing at times to hold our day's work at a distance, to regard it with broadened perspective, to ask ourselves what motive urges us to carry on our daily round. Scientific workers, and most especially those engaged in research, may enjoy, as we have, the following excerpt from *Nature* by Sir William Bragg:

> Scientific research, in its widest sense, implies, of course, far more than exploring the question of physics and chemistry and biology. It is not a religion; but it is the act of one. It is the outcome of a belief that in all things which we try to do we may by careful seeking and by a better understanding do them better; that the world, far beyond what we can see of it on the surface, is full of things which it would be well for us to know. It is our duty and our gain to explore; we have always grown by doing so, and we believe that the health of our souls depends on doing so.

Not only in research but in technical work generally it is easy to lose this vision or to fail in developing the creative attitude. Where these are lacking, the daily round becomes hopelessly monotonous, the clock becomes a tyrant, one's work seems drab and uninteresting. The thrill that comes in establishing a fragment of truth for the benefit of all mankind is, in the final analysis, the great inspiration of the scientific worker.

A Chemical Engineering Achievement

The New Pyroxylin Automobile Finish

How du Pont Chemical Engineers Developed Duco, a Product That Portends an Industrial Revolution in Wood and Metal Finishing—Some Sidelights on Its Production at the Parlin, N. J., Plant of E. I. du Pont de Nemours & Co.

By Sidney D. Kirkpatrick
Assistant Editor, *Chem. & Met.*

THIS was the problem: "To obtain an air-drying finish as tough and as durable as a baked enamel, yet with the beauty of a color varnish; a finish of sufficiently low viscosity to be applied with the pneumatic spray, yet carrying a large enough proportion of solids to have the 'build' and covering capacity of the best varnish or enamel; and finally, a finish with a hard, glass-like surface that could be applied to the cheapest toy or the most costly piece of furniture with the minimum of expense for labor, time and equipment."

A large order, to be sure, but this is just the proposition that almost 3 years ago was put up to the research chemists and engineers of the du Pont company. Particularly in the automobile industry was the demand for such a product most insistent. Six or eight or ten coats of surfacer, primer, japan, color varnish, etc., and 8, 10 or even as many as 28 days required for the finishing operations may have implied high quality to some, but it is scarcely in keeping with the well-known quantity production methods of the automobile industry. The answer to the problem was the development of a pyroxylin-type, air-drying enamel known as Duco. In the first year of its existence it has had a spectacular influence on the paint and varnish industry. It promises to revolutionize the finishing of wood and metal products.

Wherein Lies the Achievement

Pyroxylin lacquers are by no means new products. Alexander Parkes first patented them in England in 1855, and the modern amyl acetate lacquers date back to the classic series of patents granted to John H. Stevens in 1882. The novelty in the du Pont achievement is in overcoming a difficulty that has always handicapped the lacquer manufacturer. Pyroxylin exhibits the troublesome property of imparting a relatively high viscosity to solutions containing only a small amount of it. Accordingly the proportion of solids that could be incorporated into a workable nitrocellulose solution had previously been so limited that the "build" of the film and the covering power of the lacquer were seriously limited. This naturally restricted the utility of the product, since many coats of lacquer were necessary in order to yield a finish comparable with the oil varnishes. On the other hand, if the solid content of the lacquer were increased beyond a certain point, it became so viscous it could not be sprayed. Stated simply, then, the problem was to increase the solid contents of the mixture without increasing its viscosity. This was done as the result of a chemical research that permitted the incorporation into the lacquer of at least three times the former amount of pyroxylin without the solution becoming too thick or viscous to be used in the spray gun or the dipping tank. This was accomplished without the addition of any new or unusual ingredient, for the secret—if such there is—lies in the careful preparation and incorporation of the various materials.

Recently it was the writer's privilege to visit the great establishment of the Chemical Products Division of E. I. du Pont de Nemours & Co., Inc., at Parlin, N. J., and to follow the story of the production of the new enamel from the crudest raw material to the finished product. Even the casual visitor to this plant must be impressed with at least two outstanding facts. The first is that chemical control as here applied to industrial operation is not merely an idle boast. Every major operation awaits the approval of a laboratory inspection. Every crude, intermediate or final product is checked against a standard to insure uniformity. The second impression, and a peculiarly gratifying one, is the evidence of the tremendous influence of the technical man in this organization. He seems to prevail

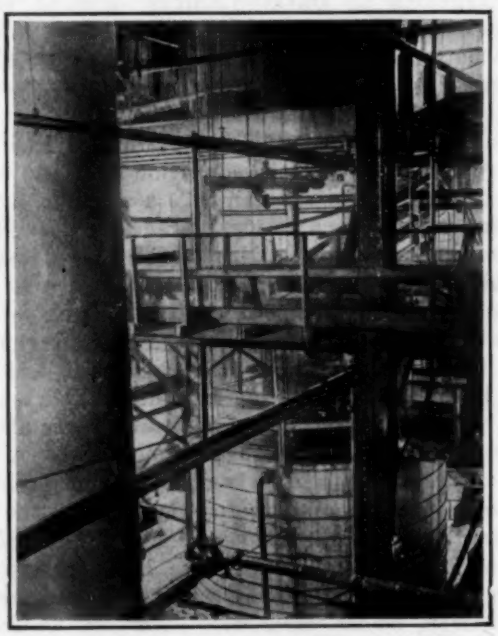


Fig. 1—In the Cotton Purification Building
The cotton linters are digested in the steel autoclaves shown at the top of the picture and drop to the wood tanks below, where they are washed and neutralized.

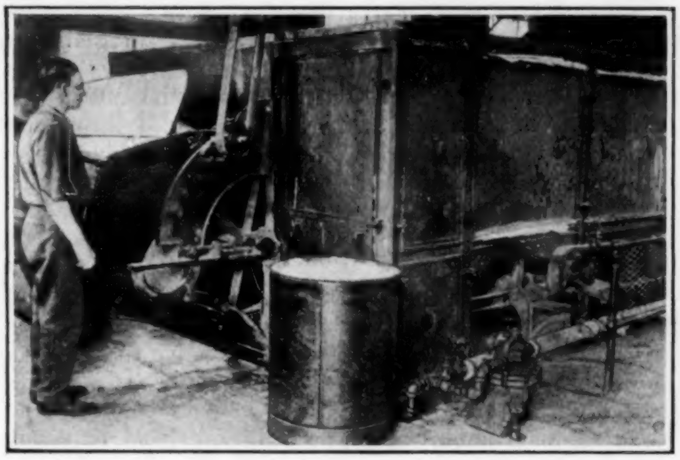


Fig. 2—Continuous Conveyor Type of Drier for Drying the Purified Cotton

everywhere. He is not confined to the laboratory, even though there are three laboratories at Parlin employing approximately seventy-five chemists and engineers. He is found in every department production, cost accounting, sales and promotion.

Pyroxylin, better known to the chemist as cellulose nitrate or nitrocellulose, varies in its content of nitrogen depending upon its degree of nitration. From 11.0 to 11.8 per cent the product is used in the so-called pyroxylin plastics, of which celluloid and pyralin are good examples. When the nitrogen content is increased to the range of 11.8 to 12.5 per cent, the solubility of the nitrocellulose in such solvents as acetone, amyl acetate and methanol undergoes a radical change. It is this grade that is used in the soluble pyroxylin products such as Duco and the clear pyroxylin lacquers used for interior finishing. When cellulose is nitrated to give a nitrogen content in the neighborhood of 12.75 per cent, the solubility again changes and the product becomes the guncotton of the explosives industry.

The manufacturing process begins with the cellulose, in this case cotton linters, which are the shorter fibers remaining on the cotton seed after the longer fibers have been removed for spinning into thread. As the crude linters are obtained from the cotton seed crushers, they vary in color from gray to brown, due to the presence of oils, wax and small particles of hull fibers. Linters are purchased in grades based on the number of pounds of fiber cut from a ton of seed. An average product is the 115-lb. grade, although during the war the government insisted that each ton of seed should yield 145 lb. of linters. The du Pont company buys linters on sample, settlement being made on the basis of a guaranteed minimum moisture content of 7 per cent. The bales of cotton linters are opened in a separate cotton storage building, and the fibers are teased apart and the dust removed in a mechanical shaker known as "devil duster."

Before the cotton can be nitrated it must first be purified by intensive chemical treatment, for the purer the cellulose the easier it is to nitrate and the greater is the stability of the finished product. The dusted linters are blown from the storage building to the digesters for the "boiling off" process. These digesters, located on the top floor of the cotton purification building, are large, false-bottomed steel autoclaves in which the soda liquor (dilute caustic soda-soda ash solution) circulates through and over the cotton in order to saponify oil and grease and to remove other impurities (see Fig. 1). Live steam is admitted and after the first washing the pressure is brought up to 100-110 lb. and kept there for about 2 hours. The digester contents are then forced through the cyclone separators, where the excess steam and liquor are freed from the cotton. The latter then drops down into the washers or diffusers, which are large wood-tanks provided with both air and mechanical agitation and with screen bottoms through which the excess of hot wash water can filter off. From the diffusers the cotton drops to the floor below into bleaching tubs, where it is mixed with a 25 per cent bleaching powder solution and held at a temperature of about 35 deg. C. for about an hour. The bleaching operation is carefully controlled, for if the process is carried too far, a part of the cellulose is hydrated, very much to the detriment of later operations.

The excess of bleach is removed by washing the cotton with dilute acetic acid, and the linters are further washed in the so-called "stuff chest." Here, too,

Fig. 3—A Section of the Parlin Works Viewed from the Top of the Cotton Purification Building
The building in the immediate foreground is the nitration house. Acid tanks are shown at the left, and beyond them may be seen the facilities for solvent storage.

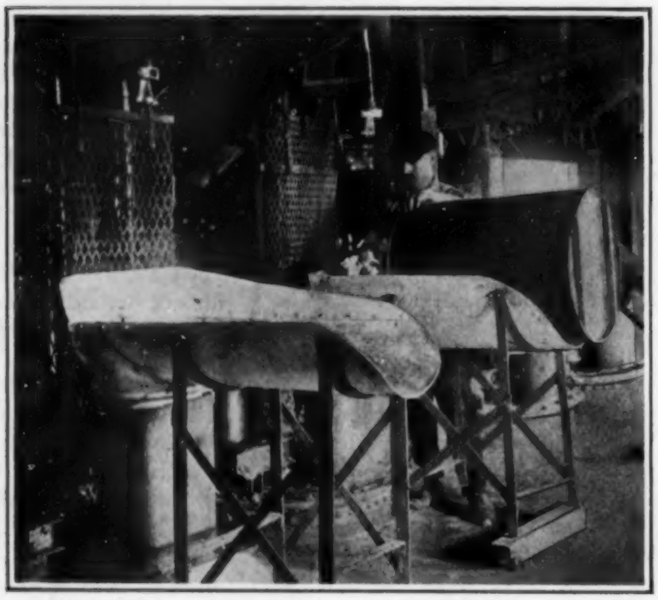


Fig. 4—Charging Cotton Linters Into the Mechanical Dippers
A charge of 35 lb. is slowly dropped into the mixed acid and agitated until nitration is complete.

both temperature and pressure must be carefully controlled. The preliminary purification of the cotton is thus completed, and it only remains for the product to be dried and nitrated. Drying is accomplished in Proctor & Schwartz continuous conveyor type of driers, one of which is shown in Fig. 2. These driers have a capacity of 800 lb. of cotton per hour, with steam at 75 lb. A preliminary drying brings the moisture content down to about 7 per cent, which is the normal hygroscopicity of the cotton. If it is desired to sell the cotton at this stage, no further drying is necessary, but if the material is to be nitrated, it receives a second drying in which the moisture is reduced to 1½ per cent, a factor carefully controlled by the laboratory, since it has an important bearing on nitration and further operations.

From the tail of the driers the dry cotton is carried by air conveyance to the top of the nitrating house shown in the center of Fig. 3. This is a three-story building in which is employed the so-called du Pont mechanical system of nitration, which Worden and others have already discussed in detail. (See E. C. Worden's "Technology of Cellulose Esters," Vol. I, part 3, pages 1994 *ff.*) The nitration is carried out in the mechanical dippers, which are steel drums with cone-shaped bottoms. They are about 2½ ft. in diameter and 4 ft. in depth. Agitation is accomplished by means of revolving paddles carried on two perpendicular drive shafts. The cotton is charged as in Fig. 4 through a small opening in the cover of the dipper, while the mixed acid is admitted through a pipe connected with the acid storage tanks. A calculated quantity (usually around 1,500 lb.) of mixed acid containing 1 part of nitric to 3 of sulphuric is placed in the dipper and a weighed quantity of cotton (35 lb. or so) is charged in slowly. Nitration is continued for 25 minutes or half an hour, and then by turning a valve in the 6-in. pipe that adjoins the base of the nitrator, its contents are dropped into the centrifugal wringer below. This is a 42-in. Tolhurst machine with overhead drive by direct-connected electric motor. (See Fig. 5.) The cotton is whizzed at a speed of about 1,200 r.p.m. for a definite period, usually 3 to 5 minutes.

The wringer is then stopped by means of a brake and its contents are discharged through the bottom of the machine. The cotton is flushed down into the drowning basin, the operator using a woolen fork to dig out the nitrated cotton that clings to the side of the rotor.

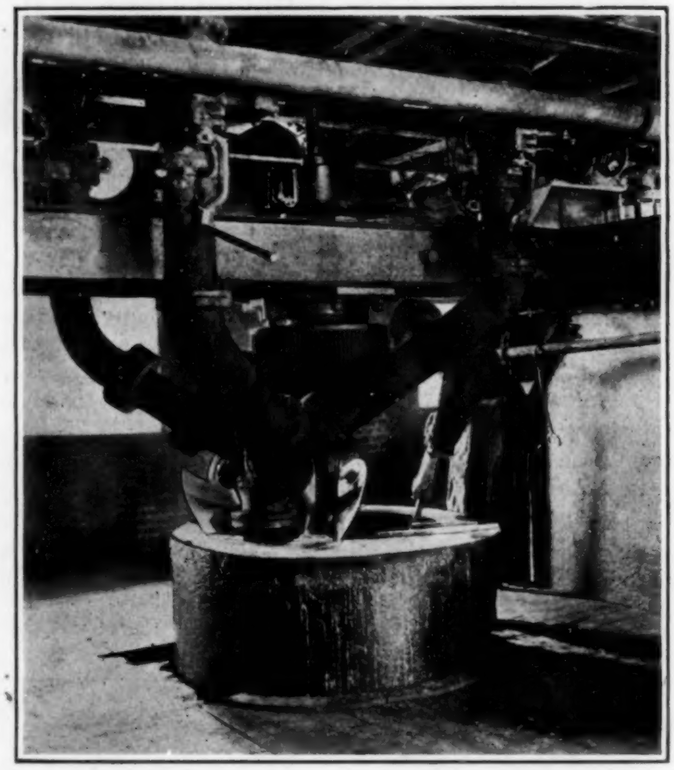


Fig. 5—Centrifugal Wringer in Which the Nitrated Cotton Is Freed From Excess Acid

The acid, having already been whizzed out of the cotton by the wringer, is carried away by gravity to the spent acid tank. To be re-used it must be filtered and fortified with the quantity of fuming sulphuric and strong nitric acids required to bring it up to strength. It is then piped to the mixed acid storage area and stored in steel tanks. The weakest acid from the first washing in the drowning basin is used in the manufacture of barium nitrate, which thus becomes a by-product of the operation.

From the drowning basins the nitrated cotton is pumped to an adjoining building for the boiling out

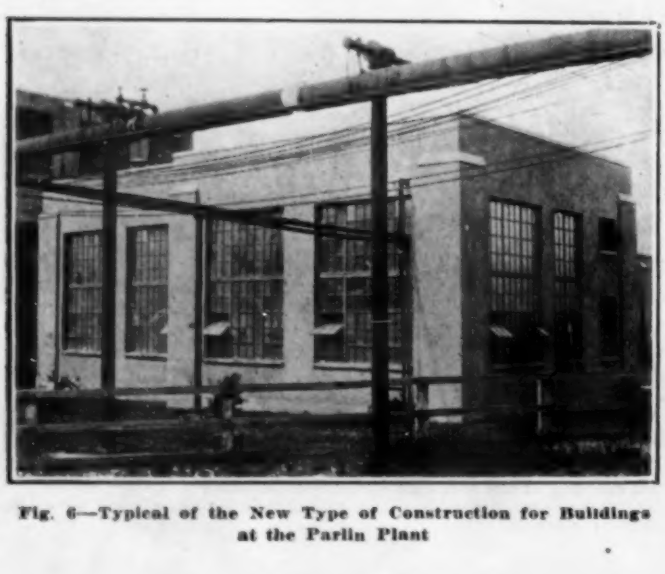


Fig. 6—Typical of the New Type of Construction for Buildings at the Parlin Plant

process. The purpose of this treatment is to stabilize the cotton by eliminating the excess of acid as well as the cellulose sulphate, sulphonic esters and other unstable compounds. The boiling, or rather steaming, for the temperature is usually kept at about 95 deg. C., takes place in false-bottomed wooden tubs, 8 ft. in diameter and 9 to 10 ft. in depth, provided with hinged wooden tops to retain the steam. The process is continued for 25 to 30 hours or until the physical and chemical properties of the product meet with laboratory approval. But even this extended treatment is not regarded as sufficient. The cotton must be pulped in beating machines that mechanically break apart the fibers, without more severe disintegration.

Water plays an important rôle in cotton purification —in fact, it is estimated that beginning with the crude linters and ending with the cellulose nitrate at least 200 gal. is required for every pound of raw cotton.

Dehydrated by Alcohol and Pressing

Zinc-lined cars carry the moist cotton to the dehydration house, where it undergoes the unique but highly efficient method of dehydration developed a number of years ago by the du Pont company and long used by the smokeless powder manufacturers. The cotton is weighed into batches of about 40 lb., and then charged into the cylinder of a special hydraulic press. The upper ram of this press closes the cylinder and a low pressure (250 lb. per sq.in.) is applied to "block" the cotton and to remove a part of the water. Strong alcohol is then pumped through perforations in the upper ram, the pressure being sufficient to force the alcohol entirely through the mass of cotton. High pressure (3,000 to 3,500 lb. per sq.in.) is then applied, and as the lower ram of the press is raised it expels the water and alcohol. After the pressing is completed the cotton is removed, samples are taken for the laboratory and the blocks (or cheese, as they are called) are packed in galvanized-iron cans. These are taken to the block-breakers, which are slowly revolving cages, octagonal in shape and provided with spikes in the corners that shred the cotton and thus make it ready for its solution in the solvent mixture.

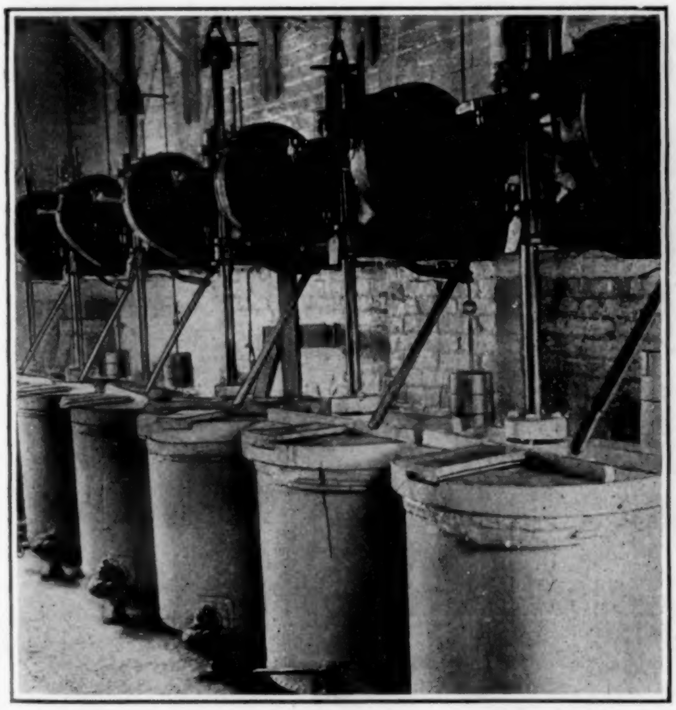


Fig. 7—A Battery of Day Mixers in the Enamel Plant

All operations at Parlin after the cotton is nitrated and purified take place in a series of new buildings recently completed for this purpose by the du Pont Engineering Co. As examples of modern chemical plant construction, these buildings are of more than usual interest to the chemical engineer in industry. They are of brick and stucco construction and accordingly fireproof. The equipment is supported on steel or concrete stanchions and every facility is provided for cleanly appearance and efficient operation. Subway iron platforms form the balconies and galleries that provide for convenient loading and operating of the equipment. The drive in most of the buildings is by electric motors, which are housed in a long narrow room that parallels the length of the building. This has many advantages from the point of view of convenience for inspection and operation and naturally reduces the fire hazard, an important factor when dealing with volatile solvents.

Fig. 8—Surveillance Boards on Which Exposure Tests Are Made

Gums Dissolved and Pigments Ground

Probably no more important factor enters into pyroxylin lacquer production than is found in the choice and manipulation of solvents. This has become a science in itself and one that is constantly being varied to meet changing industrial and economic conditions. As a class the pyroxylin lacquers are quick drying, yet one of the primary requisites for the solvent mixture is that it will not dry too quickly, for otherwise the film would shrink and wrinkle. Other required properties of the lacquer solvent are proper color, reaction, solubility in water and other solvents, hygroscopicity, miscibility and specific gravity. As previously stated, the modern lacquer industry had its practical inception in Stevens' introduction of amyl acetate. More recently butyl and ethyl acetates have become available commercially. Refined fusel oil has always been one of the most important components of the solvent mixture, although in recent years butyl alcohol, made available by the commercial fermentation of corn, has given the pyroxylin manufacturer a valuable substitute or allied product. Benzol, denatured alcohol and acetone are used in varying proportions.

The gums, or rather resins, that are used in pyroxylin lacquers and enamels are of various sorts depending upon the exact type of surface desired. They serve the triple purpose of imparting adhesive properties, elasticity and gloss. Shellac, the soft copals such as Kauri copal, and the damars are the commonly employed types. Gum mixing is accomplished by placing the gum, which has previously been ground in a cracking mill, into an aluminum-lined mixer, where it is thoroughly incorporated in the solvent.

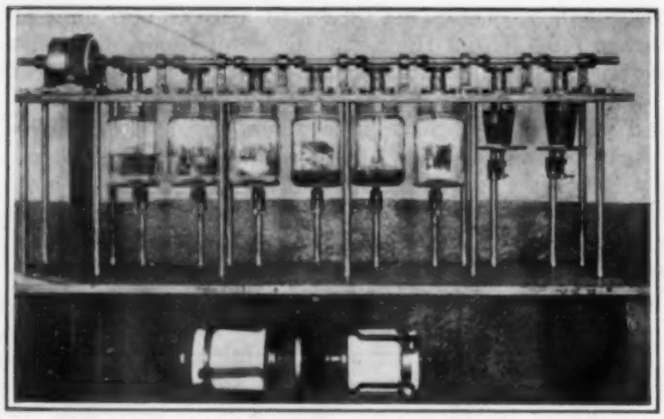


Fig. 9—Laboratory Mixing Battery for Testing the Solubility of Nitrated Cotton

As Duco is made in about fifty colors, there is necessarily a wide selection of pigments and color lakes. The grinding and preparation of these pigments are in accordance with well-known methods and equipment used in the paint and varnish industries.

The nitrocellulose, purified and treated to give it such desired physical and chemical properties as low viscosity, neutral reaction and high stability, is next dissolved in the solvent mixture. This comparatively simple operation is effected in paint or pyroxylin mixers made by the J. H. Day Co. Such a battery of typical enamel mixers is shown in Fig. 7. The nitrocellulose base must finally be filtered, in order to remove such impurities as the insoluble cotton. For this purpose standard Shriver plate-and-frame filter presses are used, the filtering medium being filter paper backed up with heavy canvas filter cloth.

The glycerine-like solution of nitrocellulose leaves the filter thoroughly clarified and remarkably brilliant in appearance. It is ready then for incorporation with the gum mixture and the ground pigment. The various ingredients are piped into the mixing room and are weighed before being poured into the mixer. The final mixing process is not greatly different from that used in dissolving pyroxylin in other industries except that the mixers are of somewhat greater capacity and the process is of longer duration. These mixers have a bottom discharge to the floor below, where the finished Duco is weighed into cans and is ready for shipment.

But research has not ended with the development of the product and its introduction to the metal and wood-finishing industries. At Parlin there are three large laboratories well equipped both from the human and physical standpoint. The Redpath Laboratory, named after Leon W. Redpath, a famous chemist and pioneer in the nitrocellulose industry, is one of the important research units at Parlin. The research and control laboratories for cotton purification, nitration and subsequent lacquer production are housed in two special buildings provided with every facility required for these investigations.

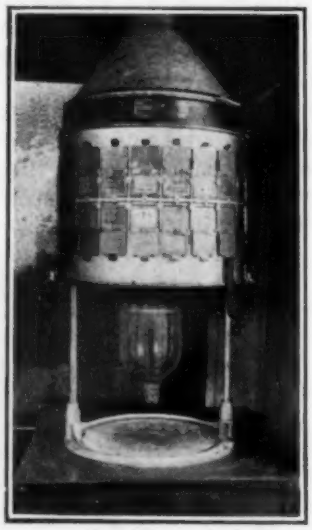


Fig. 10—Fastness of Color and Resistance to Ultra-Violet Rays Are Measured in the Color Fadometer

The third laboratory is in reality a small-scale finishing establishment for wood and metal products. It is here that the various uses of Duco finish and Viscolac lacquers are being studied by men who have gained their experience in the finishing departments of the furniture, automobile and novelty industries. The methods of application, drying and final processing are being studied by actually finishing the commercial products and subjecting them to tests of endurance, durability and performance. Here some interesting new uses for the product have been developed. It was here also that methods have been developed that have led to outstanding economies in the finishing of automobile bodies.

Since August, 1923, one of the larger motor car manufacturers has used the Duco finish with marked success. It is now standard in factory production on eight other automobiles. In April, 1924, more than 7,500 new cars were finished with Duco. (See W. L. Carver, "Labor Cost Halved by Use of Duco in Finishing Oakland Bodies," *Automotive Industries*, Sept. 10, 1923, and E. M. Flaherty, *J. Soc. Automotive Engineers*, vol. 14, p. 352.) Where it formerly required 336 hours to paint an Oakland body, the finishing time has been cut to 13½ hours. The total number of finishing operations has been decreased by 33⅓ per cent. Substantial savings have been effected in both the unit labor cost per car and the cost of finishing materials. Where formerly 2,400 bodies were continually tied up in the painting department, there are now but 600. Rejections by the plant inspectors in the past often ran as high as 20 per cent of the daily production, but since the adoption of the Duco system the rejection figure has been reduced to 2 per cent.

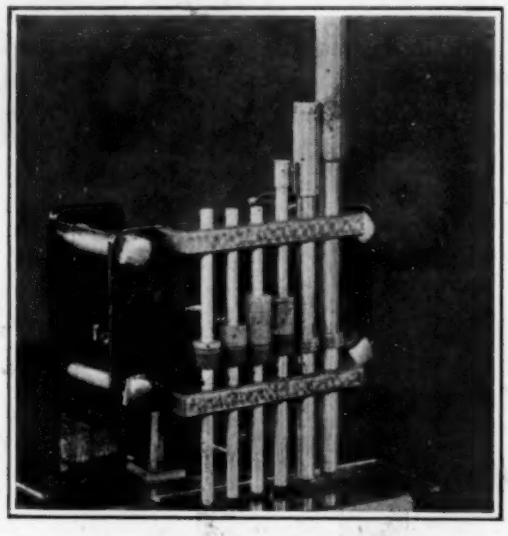


Fig. 11—Scratch Testing Machine for Determining Hardness of Enamel Films

When it is appreciated that this remarkable development—still in its infancy—has come about largely through the influence of chemical engineering in industry, we are in a better position to appreciate the sincerity with which it has been said of the chemical engineer:

"In a little more than a century he has advanced civilization by ten centuries, he has helped to pack hours into minutes, his vision has crowded the highways of commerce."

What Does Silicate of Soda Do to Soap?

In Court and Laboratory This Question Has Been Vigorously Discussed During the Past Year—Here Are the Facts From the Technical Viewpoint

By James G. Vail

Technical Director, Philadelphia Quartz Co.

> Legal battles have been fought during the past year regarding the use of silicate of soda in soap. As the smoke clears away it is evident that the technical question involved is unclarified—that is: "Does silicate of soda constitute an adulterant when used in soap products?" Whether or not this material may properly be called a soap, it is certain that its use in varying amounts affects soap in a specific manner. Moreover, repeated tests have indicated its usefulness as a detergent even when used alone. In this article Mr. Vail surveys the situation fair-mindedly, showing in what respects the use of silicate is desirable.

SILICATE of soda in soap has of late been discussed from so many points of view that it seems worth while to set down a few aspects of the case in the hope that it may lead to clearer thinking. The testimony in the case of the Federal Trade Commission versus Procter & Gamble ranged all the way from the academic position that because silicate of soda is not soap its use as an ingredient of soap is adulteration, to the position that because silicate of soda is a useful detergent it may properly be used in any proportions found by experience to be acceptable to the public. The present writer will not discuss the abstruse question as to when a mixture of silicate of soda and soap may properly be sold as soap and when it should bear some other name. He has no interest in making any one believe that silicate of soda is soap, but rather a desire to call attention to the fact that it is useful.

Standards of performance for washing compounds which might bring the evaluation of soaps or other detergents into the realm of exact procedure are not available. Hence, when experts or others discuss the merits or faults of any detergent it is necessary to establish first what they are talking about. A statement that is true for one set of conditions may be utterly wrong for another. Dirt, defined as matter out of place, is an inclusive term. All reagents for removing dirt perform differently, according to the chemical nature of the dirt, the temperature, concentration, amount and kind of mechanical agitation, composition of the water used and numerous other variables that might be listed. It is almost obvious that no one material or mixture will prove to be best adapted for all classes of washing.

Soaps Have Limited Range of Usefulness

The delicate nature of fine silk fabrics demands a degree of care in handling and a mildness of action in detergents that would be both costly and ineffective if applied to dirty overalls. It takes very little experience to acquire the knowledge that some of the finest toilet soaps are hopelessly inappropriate for salt water. Silicated soaps, for example, are used for the more vigorous kinds of washing.

Silicate of soda is not soap. It is cheaper than soap. A careful review of the commercial brands in the American market will show that soaps consisting only of the alkali salts of fatty acids are sold at higher prices per unit of weight than soaps that contain silicate. Soap is sold under highly competitive conditions and the consumer generally gets the benefit of the lowest price at which production costs permit a manufacturer to sell.

From time to time, advertisements stating that silicate of soda has no detergent value have appeared in the public press. The error of such statements is easy to demonstrate by the simple process of washing heavily soiled hands or clothing in a 1 per cent solution of silicate. No unusual perceptions are needed to see that silicate has an effect on dirt. This is not to say that it should be used alone, although experimental washing on a commercial scale with silicate as the only detergent has shown that a large proportion of the dirt from heavily soiled materials can be economically removed without the addition of any soap. Like Columbus making the egg stand on end, this is taking the shortest route to a result that might not be reached after reams of wordy argument. An English judge is said to have proved by washing his hands with it in court that silicate has detergent properties.

Soap makers have tended to think of silicate of soda from the point of view of its effects on the texture and appearance of the soap rather than from the point of view of its behavior in the washing process. In the course of a recent private conversation a prominent manufacturer of soap said that he had long felt a prejudice against the use of silicate, but when his wife demanded one of his silicated brands for use at home in preference to that which he had assumed to be superior, he began to think there must be a reason. Inquiry developed that particularly in districts where hard water is used, the highly silicated soaps are bought in preference when offered side by side with those containing less silicate or none. It was obvious that the housewife was convinced that such a soap washes better. She was not concerned with the ingredients of the soap she buys, but only with the service it performs, and her judgment weighs heavily in determining what kind of washing materials shall be made and used.

The appearance of a bar of soap is improved by the appropriate use of silicate of soda. A firm, smooth texture is produced without the sacrifice of solubility or the cost involved in the process of remelting and drying. The bloom or efflorescence that tends to develop on the surface of soaps containing sodium carbonate is not produced by silicate, but is actually restrained when silicate is present. A bar of soap that would otherwise be distorted on driving may, with the aid of silicate, remain shapely even in old age. Small quantities of silicate will prevent the decomposition of soaps that tend to become rancid on standing and it is put in some brands for this purpose alone.

Soft water is the ideal medium for all washing operations. Richardson in *Ind. Eng. Chem.*, vol. 15, p.

241 (1923) has studied the effect of soaps containing silicate of soda used in hard waters and finds that particularly in the case of waters having a high magnesium hardness and in hot water the silicate has a marked soap-saving effect, which increases as the proportion of silicate to soap increases and is greater than would be expected from the reactions in which calcium is assumed to replace equivalents of sodium, either as silicate or soap. The loss of value when soap is destroyed by calcium and magnesium salts in water is not measured alone by the loss of the soap that enters into this reaction. The insoluble metallic soap produced becomes a part of the dirt that has to be removed and it is a particularly difficult kind of dirt with which to deal. These calcium and magnesium soaps are manufactured for use as waterproofing agents for concrete and when added even in small amounts they are effective in repelling water. Most of us know how difficult it is to scrub a ring of these insoluble soaps from the smooth inside surface of a bath tub. To remove them from the meshes of textile wares is still more of a problem. On the other hand, the reaction products of silicate and hard water are less readily precipitated because of their tendency to remain dispersed in the wash liquors and if precipitated they are much more readily wetted and removed.

Some writers have asserted that large proportions of ash accumulate in fabrics washed with detergents containing silicate of soda. Examination shows that under ordinary working conditions it takes about fifty washings to bring the ash up to 2 per cent of the weight of the fiber and that the precipitate, which is highly hydrated when it separates from the solution, dries out to an inpalpable powder that can hardly be imagined to have any effect on strength, but may partly account for the improved color of goods washed in detergents containing silicate. Silicate separated from concentrated solutions is mostly gritty, but much examination has failed to reveal a case where silica separated under conditions of ordinary washing practices had the slightest suggestion of a sandy texture.

Silicate Improves Emulsifying Power

Studies by Stericker (*Ind. Eng. Chem.*, 1923, vol. 15, p. 244) and by Richardson show that the presence of silicate improves the emulsifying power of soap solutions. Stericker's data also show that from the point of view of emulsifying, silicates of soda of the type containing relatively large quantities of silicate are better than the more alkaline varieties. A silicate of the composition $Na_2O.4SiO_2$ appears to be better than an equal amount of sodium carbonate. The presence of silicate of soda increases the amount and stability of the lather formed by soap, for which purpose it is more effective than sodium carbonate except when used in concentrations greater than those ordinarily employed in washing.

From the foregoing it will appear that silicate of soda belongs in an entirely different class from inert materials sometimes added to soap. It has been rightly called a builder. To describe it as a filler indicates a lack of acquaintance with its properties. Examination of the testimony in the Federal Trade Commission case above cited does not show that any of the witnesses who took the position that all additions of silicate of soda to soap are adulterations had either a close personal knowledge of the recent literature on the subject or had made a study of the behavior of soap in the washing process. On the other hand, those witnesses whose testimony showed that they had gone thoroughly into the study of detergent action all agreed that some silicate of soda was desirable in a laundry soap, but differed in their judgment of the appropriate amount.

Circular 62 of the U. S. Bureau of Standards, Third Edition, Jan. 24, 1923, recognizes the value of building substances such as silicate of soda for "hardening and rendering soaps more detergent when used with hard water," and gives a specification which would allow the presence of silicate of soda up to nearly 20 per cent on a dry basis. There are few laundry soaps on the market today that contain as much as this. A representative series of analyses shows an average slightly under 12 per cent.

Commercial users of detergents, such as laundries, are in a position to buy pure soaps and builders separately and to make up the wash liquors in the proportions found to be most suitable. Such a procedure is too inconvenient for the small-scale operations of the household wash or for scrubbing the floor and woodwork. For these a cake ready to use is the best, and experience has shown that silicated soaps are both effective and economical. The demand for them has grown because they are adapted for the work they have to do.

The solution of the problem of when a mixture of soap with other detergent materials is entitled to be called soap must await the establishment of definite standards based on a full knowledge of process and materials. At that time it will doubtless be possible to select a designation for the mixtures that contain too much builder to be entitled to the name soap so that the manufacturer may be able to serve the consumer economically, satisfactorily and without hint of misrepresentation.

Quenching Properties of Glycerine and Its Water Solutions

The cooling power of glycerine and its water solutions as well as that of an oil-water emulsion has been examined by the U. S. Bureau of Standards for the purpose of finding quenching media to span the gap between water and oil. From experimental quenching curves giving the rate of cooling at the center of a 1-in. cylinder of 32 per cent nickel steel, it was found that glycerine-water solutions accomplish this purpose effectively and that, moreover, they have characteristics distinctive from those of oil and apparently in their favor.

The observations on the cooling rates of the baths were confirmed by observations of the hardening of deep-hardening steels in the several baths. The hardness of these steels, measured by the scleroscope and Rockwell tests, increased slightly but definitely with the cooling rate, and the higher hardness of the faster cooled steels was maintained on tempering at low temperatures. This variation in hardness was correlated with the cooling rate during the hardening transformation and is therefore probably a transient tempering phenomenon.

By mathematical analysis of the results, cooling constants of the several baths have been approximately evaluated and curves plotted from which the cooling rate at the center and the temperature differences between center and convex surfaces of long cylinders of any diameter can be estimated under certain limitations.

An Economic Study of Evaporators

Cost of Installation and Operation of the Five General Classes of Evaporators and a Discussion of the Variable Factors

By Tyler Fuwa
Research Associate, Massachusetts Institute of Technology

EVAPORATION

On March 3, *Chem. & Met.* published the first article in this series, entitled "Cost of Filtration Equipment and Operation." Mr. Fuwa has extended his careful survey to evaporators and there is contained in this article some unique data on evaporator costs, together with a clear exposition of a convenient and conservative method of estimating evaporator operation. Together with the previous article it should prove a most effective tool for the chemical engineer.

A UNIT PROCESS OF CHEMICAL ENGINEERING

THE aim of this discussion is to present, in useful form, the initial cost of evaporator equipment of various types, and to illustrate, by means of working problems, a method for the calculation of operating costs. It is clear, of course, that the various factors entering into the cost of evaporation will vary in relative importance under different conditions of operation. The relation of certain of these factors to total operating cost is considered under the section on economic balance. It is hoped that the discussion as a whole will help to clarify some of the problems incident to evaporation costs.

Classification of Evaporator Bodies*

Although a number of distinct evaporator types are possible, depending upon the method of removing the evolved vapor and of supplying the heat of vaporization, only that type in which the vapor is removed in undiluted form and in which the heat of vaporization is supplied by condensing steam will be taken up here.

The means provided to supply the heat of vaporization and to remove the evolved vapor have given rise to a wide variation in the design of evaporator bodies. That is, the tubular heating surface may be horizontal, vertical or inclined; the steam may be either inside or outside these tubes, and the liquor may submerge the heating surface or may simply film it. Five distinct evaporator types are of importance commercially, and these may be outlined as follows:

(1) Tubes horizontal, liquor outside, heating surface submerged. This is perhaps the most widely used evaporator and possesses the features of simplicity and strength. A good example of this type is the Swenson.

(2) Tubes horizontal, liquor outside in film form. Because of positive liquor circulation and the relatively short time of contact between the liquor and heating surface, this evaporator is well suited to liquors of high concentration. The Lillie belongs to this type of machine.

(3) Tubes horizontal, liquor inside, heating surface submerged. This rapid circulation type has the added advantage of very positive liquor contact with the heating surface, and is adapted especially to liquors sensitive to heat. The Yaryan is an example of this type.

(4) Tubes vertical, liquor inside, heating surface submerged. In this evaporator, good natural convection is secured by means of a large central downtake. The ease with which incrustations may be removed from the tube surfaces is also a feature. This is widely known as the standard vertical type.

(5) Tubes vertical, liquor inside in rapid circulation. The liquor velocity attained in the heating tubes makes possible a very high overall coefficient of heat transfer. This type is suited to an extremely wide range of materials, and is illustrated by the Buflovak Rapid Circulation Evaporator.

Evaporator Auxiliaries—Every evaporator body must be equipped with auxiliary apparatus for the removal of condensed water and noncondensible gases, for the removal of evolved vapor and for the pumping of liquor. In certain other cases special means must be provided for the separation of crystallized solids, or to aid in the disengagement of vapor from the boiling liquor. A wet vacuum pump is commonly employed to remove the condensed water from the heating element, while a condenser either of the jet or surface type, in series with a vacuum pump, is necessary for the disposal of the evolved vapor.

The type of evaporator selected often depends upon the work being done. There are, however, many liquors that may be handled satisfactorily in practically every type of evaporator, and in such cases the relative evaporative capacity will be about as follows (calculated from the data of E. W. Kerr, *Jour.* A.S.M.E., July, 1916):

(*a*) Horizontal submerged tube type 100.

(*b*) Vertical, submerged tube type 100.

(*c*) Rapid circulation type, horizontal or inclined tubes 130.

(*d*) Rapid circulation type, vertical tubes 150.

A factor of even more importance than machine type is that of scale formation. W. L. McCabe and C. S. Robinson ("Evaporator Scale Formation," paper read before A.C.S. spring meeting, April 21-26, 1924) have studied the effect of scale upon the overall coefficient of heat transfer in evaporator heating surfaces. From the results of work by three independent investigators,

*For a full discussion of evaporator body types and the theory of design see Walker, Lewis & McAdams, "Principles of Chemical Engineering," pp. 383-435; Mantius, Otto, Sec. x, "Handbook of Chemical Engineering," Donald Liddell, editor.

it was found that the coefficient H varied with time and with the solution in accordance with the equation

$$1 \div H^2 = c\theta + \text{constant},$$

where H = the overall coefficient of heat transfer, θ = time, and c = a proportionality constant.

Starting with clean tubes and evaporating concentrated inorganic salt solutions, it was found that the scale formed in from 2 to 5 hours time was sufficient to reduce the initial value of H by 50 per cent. The economy of maintaining clean tubes is obvious.

Initial Cost of Equipment

The cost of evaporators cannot be expressed satisfactorily in terms of any simple capacity function, because of the many important variables involves. Design varies greatly with different types. Furthermore, the terminal conditions of operation—that is, temperature and pressure, and the kind of liquor—are controlling factors in evaporative capacity. It is possible, however, to express costs in terms of heating surface for a single effect unit, exclusive of auxiliary equipment, such as pumps and condensers. Knowing the type of evaporator best adapted to a given liquor, and knowing

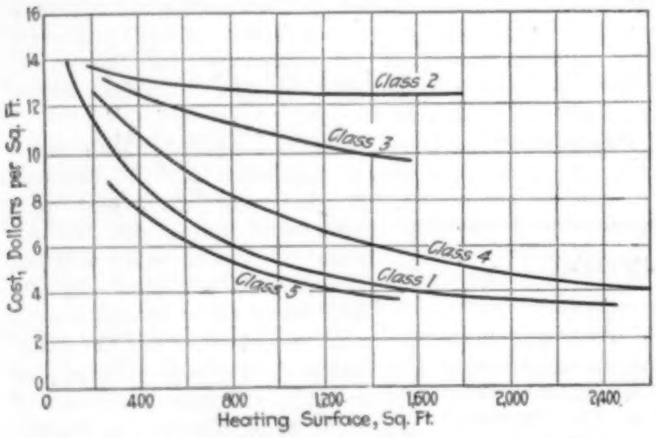


Fig. 1—Cost of Evaporators, Single Effect, Not Including Condenser or Pumps

Class 1—Tubes horizontal, liquor outside, tubes submerged.
Class 2—Tubes horizontal, liquor outside, in film form.
Class 3—Tubes horizontal, liquor inside, rapid circulation.
Class 4—Tubes vertical, liquor inside, submerged type.
Class 5—Tubes vertical, liquor inside, rapid circulation.

also the evaporative capacity to be expected, both equipment and operating costs can be predicted with reasonable accuracy.

Fig. 1 shows the cost of single effect evaporators, exclusive of auxiliary equipment. The classification is the same as was used in the description of apparatus in the foregoing section.

Calculation of the required initial investment presupposes a knowledge of the following engineering data:

(1) The types of evaporator which are suitable, and the proper materials of construction.

(2) The probable evaporation per sq.ft. of heating surface, under the specified operating conditions.

(3) The number of effects in the system. This is determined by an economic balance involving the fixed charges on the investment and the operating costs, and will be discussed later.

Once the necessary heating surface has been determined, the cost of the evaporator effects alone is obtained by reference to the cost curves in Fig. 1. For example, suppose that 2,000 sq.ft. of total heating surface is required in a triple effect horizontal tube evaporator of the submerged type having the liquor outside the tubes. Each effect will have approximately 700 sq.ft. of heating surface costing \$6.50 per sq.ft., and the cost for three effects will be

$$(3)\ (700)\ (6.50) = \$13{,}650$$

when iron tubes and cast-iron bodies are specified. The necessary auxiliary equipment, including condenser, vacuum pumps and liquor pumps, will add about 30 per cent to the foregoing base cost, and the cost of installation and piping will amount to 25 per cent of the overall equipment cost, making the total initial investment

$$(13{,}650)\ (1.30)\ (1.25) = \$22{,}200$$

The cost of auxiliary equipment varies considerably and is substantially a function of the amount of vapor and liquor to be handled. Condensers average from 8 to 10 per cent of the base cost, and may be as low as 5 per cent in the case of large multiple effect installations, or as high as 20 per cent for very small evaporators.

Vacuum pumps average 16 to 20 per cent of the base cost, and here again the variation may be from 10 to 40 per cent of the base cost, the smaller percentage being applicable to large installations. Salt catches, when needed, add about 10 per cent to the base cost. Liquor pumps and minor accessories amount to another 5 per cent.

The cost of installation depends very considerably upon local prices of material and labor. When the cost of piping and of heat insulation is charged to installation, 15 per cent of the cost of evaporator plus auxiliaries is probably a minimum figure, while 25 to 30 per cent may be taken as an upper limit.

In multiple effect systems condenser costs are lowered very nearly in proportion to the number of effects. The same rule applies, in theory, to the vacuum pumps, but due to the high ratio of dead gas to steam, not much reduction is obtained in actual practice. Liquor pumps and other accessories are directly proportional to the number of effects. The net result is that the overall charges for auxiliaries increase very nearly in proportion to the number of effects, independent of the type or capacity of the evaporator.

Another variable in equipment costs arises from the materials of construction employed. The substitution of copper tubes for iron increases the base cost per effect about 5 to 10 per cent, according to the price of copper and type of evaporator. Steel body construction and tubes cost about 20 per cent less than does the usual iron construction. Rapid circulation evaporators, constructed entirely of copper, cost from 100 to 120 per cent more than if built of cast iron with copper tubes.

The ordinary vertical type of evaporator, when equipped with submerged lead tubes and lead-lined body, costs 150 per cent more than does the regular iron construction. The cost of other special types of construction is difficult to express on any definite basis, and will not depend to any extent upon competitive factors.

Operating Costs

Operating costs in the unit operation of evaporation may be classified as follows:

1. Interest on investment.
2. Depreciation.
3. Taxes and insurance.
4. Rent and administration.

5. Steam for evaporation and power.
6. Cooling water.
7. Direct labor.
8. Maintenance and supplies.

Fixed charges in the case of evaporators are much easier to determine than are the items due strictly to operation, such as steam, cooling water, labor and maintenance. Interest on the investment may be taken at 6 per cent. Depreciation, of course, depends upon the work being done. While many installations have been

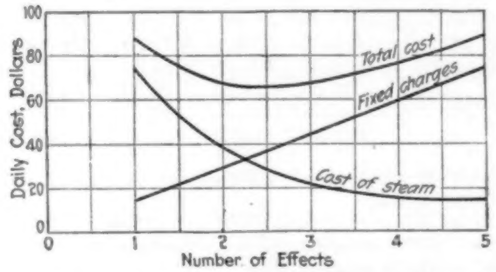


Fig. 2—Economic Balance in Operation of Evaporators

in service for 30 years, others have had to be scrapped within 10 years time or even less. However, it is safe to call the average useful life of an evaporator 20 years, charging a uniform 5 per cent per year against this item. Taxes and insurance rarely exceed 3 per cent of the initial investment.

Evaporator equipment occupies a large amount of floor space and head room, and often a separate building houses the installation. For this reason it is legitimate to include rental against the cost of production. Furthermore, in certain cases where evaporation forms a relatively important part of the process as a whole, as in the manufacture of sugar, salt and caustic soda, it is good practice to distribute a portion of the general administrative expense of production to this unit operation. In the discussion which follows, rent and general administrative expense will be omitted, since for purposes of illustration, no assumed charge would represent average practice.

Methods of costing steam* vary widely, since the exhaust from non-condensing reciprocating engines is often used for purposes of evaporation, and it is clear that in such cases the cost of steam is not chargeable entirely either to the power plant or to the evaporator house. It is plain that no hard and fast rule can be laid down in determining the cost of exhaust steam. Whatever the basis of calculation, there are certain factors which should be taken into consideration, however:

(1) The power plant abstracts from steam a certain amount of work which is chargeable directly to power cost.

(2) The evaporator house abstracts from the exhaust steam a certain amount of work which is potential power. The evaporators should be charged with the value of this potential power as measured from exhaust pressure to condensing pressure.

(3) The evaporators act as a condenser for the engines, hence the power plant should be charged with the cost of condensing.

For the present purposes of calculation, steam for evaporation will be charged at an arbitrary figure of 40c. per 1,000 lb. In the calculation of steam consumption for evaporation, it is safe to assume from 0.80 to 0.90N lb. of water evaporated per pound of steam, where N = the number of effects. The approximate steam consumption for auxiliary equipment will be between 8 and 15 per cent of that needed for evaporation, in the case of a triple effect installation. Pump efficiency, capacity and the number of effects constitute the major variables. An approximation of power requirements may be obtained also by assuming the steam consumption of dry vacuum pumps to be 50 lb. per hp.-hr., and for wet vacuum and liquor pumps 100 lb. per hp.-hr. Some allowance should be made for the fact that about 85 per cent of the steam used by the auxiliaries is ordinarily employed for evaporation.

Cooling water requirements are proportional to the amount of steam used for evaporation, the temperature of injection, and the vacuum maintained in the last evaporator effect. The type of condenser used will also cause some variation in the amount of water necessary for cooling. A safe allowance is 30 lb. of cooling water per pound of steam, assuming an entrance temperature of 70 deg. F. and a vacuum of 26 in. in the last effect. While municipal water rates vary from 50c. to $1 per 1,000 cu.ft., water may be pumped from nearby sources at a cost of from 1c. to 10c. per 1,000 cu.ft.

Labor requirements vary from one man who can handle any small installation up to an ordinary triple effect having about 700 sq.ft. heating surface, to four men necessary for the operation of the largest size quadruple effect salting-out evaporator. As a rule, one man can handle any single or multiple effect evaporator working on easy boiling material such as glucose and have other responsibilities as well. The extra men required for complicated layouts are usually classed as helpers and receive less wages than does the operator.

Maintenance of equipment and repairs should be allowed for to the extent of 6 per cent of the total investment. Tube replacements and cleaning constitute the greatest source of expense. The magnitude of these items varies greatly according to the liquor evaporated, and they are perhaps the most difficult of costs to generalize upon with any degree of accuracy.

Illustrative Example of Evaporator Operation

Black liquor from the soda digestion of wood in a pump mill is being evaporated from 7 deg. Bé. (sp.gr. = 1.05) to 36 deg. Bé. (sp.gr. = 1.33) in a quadruple effect horizontal submerged tube evaporator. Exhaust steam at from 5 to 10 lb. gage is used for evaporation, and a 26 to 27-in. vacuum is maintained in the last effect. A total of 70,000 gal. of liquor is concentrated daily, giving 10,800 gal. of product and evaporating 490,000 lb. of water. The total daily steam consumption is 148,000 lb., of which 145,000 lb. is condensed in the evaporator. Each effect has 1,800 sq.ft. of heating surface consisting of charcoal iron tubes. Tests show that 3.40 lb. of water is being evaporated per pound of steam. Under present conditions of operation, the capacity of the evaporator is limited by foaming. What is the cost of evaporation?

Solution:

(1) *Investment Charge*—From Fig. 1 it will be seen that a horizontal submerged tube evaporator of Class 1 having 1,800 sq.ft. of heating surface costs

$$(1800)\ (3.80) = \$6{,}840 \text{ per effect.}$$

Since there are four effects, the base cost in this case will be

$$(4)\ (6840) = \$27{,}360$$

This being a large installation, an allowance of 8 per cent for a condenser, 16 per cent for vacuum pumps and 5 per cent for liquor pumps and minor accessories is conservative. An additional 6 per cent should be included to provide for special separator construction, which is practically essential in the evaporation of a foaming material such as black liquor. The cost of evaporator complete with accessories will then be

$$(27{,}360)\ (1.25) = \$36{,}936$$

*For a discussion of the Cost of Exhaust Steam, see article by the author, *Chem. & Met.*, vol. 31, No. 4, July 28, 1924.

The cost of installation, including all pipe connections, foundations and lagging, will not exceed 25 per cent of the overall equipment cost, making the total investment

(36,936) (1.25) = \$46,170

upon which the daily interest charges amount to

(46,170) (0.06) ÷ 300 = \$9.23

(2) *Depreciation* at 5 per cent will be

(46,170) (0.05) ÷ 300 = \$7.68

(3) *Taxes and insurance* at 3 per cent amount to

(46,170) (0.03) ÷ 300 = \$4.62

(4) *Steam costs*, charging 40c. per 1,000 lb., will be

(148,000) (0.40) ÷ 1,000 = \$59.20

(5) *Cooling water* is pumped from a nearby river at a cost of 5c. per 1,000 cu.ft. Allowing 30 lb. of water per pound of steam condensed, this item will be

(148,000) (30) (0.05) ÷ (1,000) (62.5) = \$3.56

(6) *Labor*—One evaporator man at \$5 will be needed for each three 8-hour shifts, making the labor charge

(5.00) (3) = \$15.00

(7) *Maintenance* of equipment and repairs at 6 per cent on the initial investment will be

(46,170) (0.06) ÷ 300 = \$9.23

Summary of Charges to Evaporation:

		Per Cent
Interest on investment	\$9.23	8.5
Depreciation	7.68	7.1
Taxes and insurance	4.62	4.3
Steam	59.20	54.5
Cooling water	3.56	3.3
Labor	15.00	13.8
Maintenance	9.23	8.5
Total daily charges	\$108.52	100.0

Since 490,000 lb. of water is evaporated daily, the unit cost of evaporation is

(108.52) (1000) ÷ 490,000 = \$0.22 per 1,000 lb. water evaporated

Economic Balance in Evaporator Operation*

In any large-scale process, multiple effect evaporation results in great savings unless fuel costs are low, or unless a very corrosive liquor is being handled. While in theory 1 lb. of steam will evaporate N lb. of water, where N = the number of effects, the actual evaporative efficiency attained in practice varies widely. Furthermore, an increase in the number of effects causes a nearly proportionate increase in the initial investment required.

From the foregoing it will be seen that the determination of the number of effects N in a multiple effect system resolves into a problem of economic balance between the fixed charges on the initial investment and the cost of steam and cooling water. The optimum number of effects will naturally vary with the cost of fuel and equipment, but as a rule it may be said that more than five effects are seldom justified, except in the large-scale evaporation of extremely dilute solutions. The following example will serve to illustrate the principle of economic balance in operation:

It is desired to evaporate 150,000 lb. of water per day of 24 hours from a saturated salt liquor, using a vertical submerged tube evaporator equipped with salt catches. Assume the following conditions:

(1) Operation 24 hours per day, 300 days per year.

(2) Labor same for any number of effects.

(3) Exhaust steam at 40c. per 1,000 lb. is available. The cost of cooling water at 5c. per 1,000 cu.ft. may be neglected.

(4) Evaporation in a single effect is at the rate of 10 lb. per sq.ft. per hour and 0.80 lb. of water is evaporated per pound of steam.

(5) The total annual fixed charges, including a loading for interest, profits, repairs and general administrative expense, is 40 per cent of the initial investment.

In calculating the optimum number of effects, the expected rate of return on the investment should be included in the fixed charges. This return will ordinarily be about 20 per cent at least, while the nominal rate of interest is only 6 per cent. A calculation of actual operating costs will, of course, include only the 6 per cent nominal interest charge, but in a problem of economic selection, profits should be taken into account.

A single effect evaporator of sufficient capacity, together with all accessories and installed ready for operation, will cost \$11,000. Assuming N effects, the fixed charges per day will be

(11,000) (0.40) (N) ÷ 300 = \$14.67 N

The steam cost will be

(150,000) (1) (0.40) ÷ (0.80) (N) (1000) = \$75.00 ÷ N

	One Effect	Two Effects	Three Effects	Four Effects	Five Effects
Fixed charges	\$14.67	\$29.33	\$44.01	\$58.67	\$73.35
Steam	75.00	37.50	25.00	18.75	15.00
Total	\$89.67	\$66.83	\$69.01	\$77.42	\$88.35

The optimum number of effects can be calculated from the equation

Total daily cost = $14.67N + (75.00 \div N)$

which when differentiated with respect to the number of effects and equated to zero gives

N = *Cost steam* ÷ *Fixed charges* = 75.00 ÷ 14.67 = 2.27

This equation is also represented graphically by Fig. 2.

Another desirable feature of multiple effect systems is their flexibility. At times of considerable overload, the effects can be operated singly—that is, in parallel—thus securing high capacity, while at ordinary loads the economy of series multiple operation can be realized. Should such peak load operations be anticipated, it is of course necessary to provide sufficient condenser and pump capacity in the original installation.

The author wishes to thank Otto Manlius and Prof. Walter G. Whitman for their helpful criticism.

*This discussion is based on Walker, Lewis and McAdams, loc. cit., pp. 319-322.

Recovering Gas From Carbonaceous Wastes

Description of the Type of Plant Used in Great Britain for Making Fuel From Industrial Plant and City Refuse

By C. H. S. Tupholme
London, England

THE adaptability and economy of producers arranged to carbonize fuels other than anthracite, bituminous coal or coke are being more and more widely appreciated by those plants that find themselves with a supply of carbonizable refuse such as sawdust, shavings or chips and bark. Such material is frequently expensive to get rid of, but with the installation of a suitable producer it becomes a dependable source of power, limited only by the supply. This problem has been studied for some years by British engineers, and several types of refuse producers of the suction type have been evolved that give excellent results. Only the wood refuse was mentioned above, but other forms of vegetable waste are equally suitable—for instance, rice husks, olive refuse, coconut shells, cork refuse, sunflower and cottonseed husks and cotton stalks. Prunings from tea gardens, nut shells, spent tan and wattle bark, crushed sugar cane and flax refuse all contain latent possibilities of cheap power.

The general principle of operation is the same in nearly all cases: A gas engine sucks air through a mass of incandescent fuel, converting it into carbon monoxide, and this gas, with the hydrogen and other gases in the final product, is combustible, and suitable

for operating internal combustion engines or for firing under boilers.

The richness of the gas is dependent upon the quantity of carbon in the fuel, and as refuse of the types mentioned is lower than bituminous coal in calorific value, the producers have to be larger for a given horsepower. The conditions under which carbonization proceeds must also be varied in accordance with the fuel. For example, a sawmill or cabinet-making plant giving refuse in, say, the proportion of 30 per cent sawdust, 40 per cent shavings and 30 per cent chips alters on occasion to 75 per cent sawdust and 25 per cent shavings, or perhaps it will be necessary to mix in bark and similar material to make up the quantity. It then becomes desirable, from the point of view of economy, to readjust the conditions of carbonization.

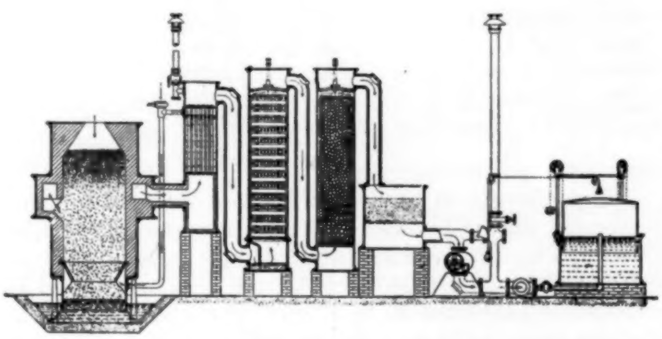


Fig. 1—Typical Plant for Carbonizing Waste Coals
This plant consists of producer, vaporizer, water seal, wood-grid scrubber, coke scrubber, sawdust scrubber, exhauster and holder in the order named.

This flexibility is a feature of the majority of the British plants. Another feature is that the design is such that the tarry matter is dealt with in the early stages of heating. In some types this tar is allowed to collect in the sump and the scrubber, but as a general rule it is dealt with before the condensation of the gas and a considerable proportion of it is converted into gas.

In general the advantages of employing these refuse fuels may be summed up under the following heads:

1. It enables materials hitherto considered as waste to be converted into power. In the case of a plant installed at the works of the Great Western Railway Co. sufficient electric power is generated to light and run a large sawmill, the plant being rated at 350 hp.
2. Practically any carbonaceous matter that will burn without caking may be used as fuel.
3. The gas produced is clean, uniform in quality, practically free from tar, of good calorific value, and as suitable for power purposes as that made from anthracite.
4. Space occupied is small.
5. The plant is adjustable to deal with different fuels and mixtures of fuels without alteration.
6. The plant can be arranged with an open top to allow of mechanical feeding by conveyor.
7. The production of gas tar is small, almost all the hydrocarbons being converted into fixed gas.
8. No steam is required.
9. No skilled attention is necessary.

In the case of dry fuel composed of, say, 13 per cent bits, 31 per cent chips or shavings and 56 per cent sawdust, the fuel consumption is 2.25 lb. per b.hp.-hr. With green wood this figure probably would be 3 lb. The damper the fuel the greater the consumption, but in most cases the amount of moisture in the fuel charged should not exceed 50 per cent.

In one type the producer body is a simple cylindrical casing of mild steel plate provided with a substantial lining of firebrick. A waste valve is provided so that the gases can be liberated to the atmosphere if this is ever necessary. A dust separator is installed through which the gas passes on its way to the scrubber, the heavier particles being deposited in a sump. The sump is equipped with lutes to enable the separator to be cleared without interfering with the operation of the plant. The wet scrubber consists of a steel plate cylinder, the lower part being of cast iron to resist the corrosive action of the water in which it is set, as this water is slightly acid after contact with the gas. The filtering medium is coke, and a water spray is fitted at the top, serving both to cool and to wash the gas. From there the gas passes through a centrifugal washer of cast iron and containing a bladed disk revolving at high speed. This washer also has water sprays at the top for cleansing.

The dry scrubber in the plant serves also as a holder for the gas. Part of the body is filled with wood wool or similar material carried between gratings. These plants are made in all sizes from 11 to 624 hp., the smallest being roughly 13x6x9 ft., and the largest 38x33x24 ft.

Another widely used plant is that shown in Fig. 2. Here the producer is of thick steel plates lined with firebrick and packing, doors being provided in the casing for cleaning out the fire. Instead of leaving the chamber by the usual single outlet, the gas is taken off at two or more points at the top of the generator

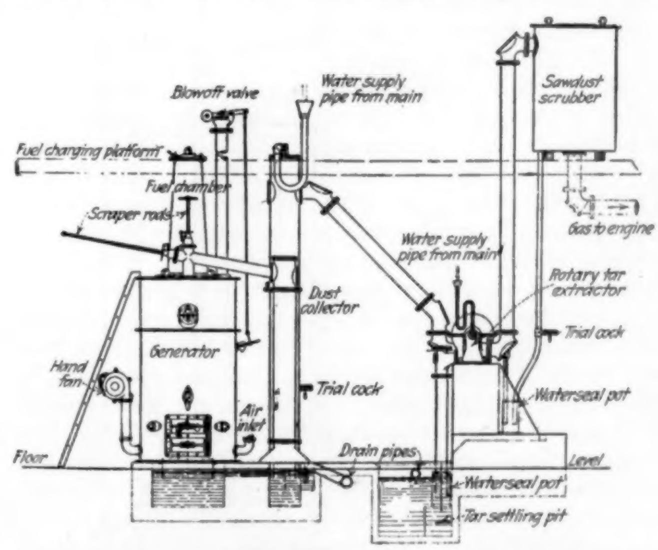


Fig. 2—A Type of Waste-Carbonizing Plant Used for Wood
This plant is provided with a dust collector for cleaning the gas—a process made necessary when using certain wastes.

by vertical pipes, which are led into the main pipes sloping down toward the dust collector. These outlets are arranged so that an even draught throughout the fuel bed at all loads is assured. The outlet pipes from the producer are fitted with scrapers to remove the tar and dust deposits without interfering with the evolution of gas. From the top of the dust collector the gas passes to a two-stage rotary tar extractor, where the tar is thrown out before the gas is passed into the sawdust scrubber.

This plant requires about 8 gal. of water per b.hp.-hr. for cooling and cleaning the gas. Most of this water

can, of course, be used over again by installing a filter sump and circulating pump, but there should always be available at least 1 gal. of fresh water per b.hp.-hr.

A vaporizer is not necessary when using wood refuse and similar fuels, but if anthracite or coke be mixed in to make up the quantity of gas, a vaporizer, as shown in Fig. 1, must be fitted to the generator and a double valve hopper to the top of the fuel chamber.

One such plant of this type will satisfactorily carbonize waste fuels containing 50 per cent moisture, and the fuel consumption per b.hp.-hr. does not exceed 4 lb. Such a plant has been operating for some time in an explosives factory.

In some cases difficulty is experienced by the supply of waste fuel running out, and an auxiliary fuel must be called in. In the carbonization of ordinary wood waste no steam is required, but when using bituminous coal, anthracite or coke, steam is necessary. This supply is provided for by generating the steam on a step fire grate.

The time required to generate good gas up to 150 hp. is about 10 minutes, assuming that the fire has not been quenched during the previous day's run.

Considerable progress has also been made in the carbonization of ordinary city refuse in a special type of producer shown in Fig. 3. The composition of dry city refuse naturally always varies with the season and the locality, and trade refuse differs with the industries in the neighborhood, but an average composition of dry city refuse in Britain approximates very closely to the following:

	Per Cent
Fuel, consisting of cinders, unburnt and partly burnt coal, etc.	30 to 35
Dust	30 to 40
Debris, bottles, china, shale, brick, etc.	10 to 12
Tins	1
Light debris or "tailings," made up of vegetable refuse, paper, rags and light trade refuse...	10 to 12

It is from the cinders, partly burned coal and also from the "tailings" that power gas can be derived. From the average composition of dust-bin refuse it will be understood that about 40 to 47 per cent of the total is available for conversion to gas. Thus, in a community of, say, 8,000 people, the dry dust-bin refuse amounts to an average of 5 tons per day. There would thus be available for conversion to gas:

Fuel, cinders, etc.	say 35%	35 cwt.	30 to 35 cwt.
Dust	40%	40 cwt.	. . .
Debris	12%	12 cwt.	. . .
Tins	1%	1 cwt.	. . .
"Tailings"	12%	12 cwt.	10 to 12 cwt.
	100%	100 cwt.	40 to 47 cwt.

Experiments in the carbonization of dry wood have revealed that the power available from one ton is about 740 hp.-hr. The carbonization of city refuse "tailings" yields about 500 to 600 hp.-hr. per ton, so that in the township above the 40 to 47 cwt. of carbonizable refuse yields from 1,170 to 1,400 hp.-hr., the average calorific value of 1 cu.ft. of the gas being 130 B.t.u.

The gas from this city refuse is available either for use in internal combustion engines or for firing under boilers.

In the drawing, Fig. 3, the three zones are marked *A*, *B* and *C*. *A* is the high temperature or zone of combustion, *B* is the zone of conversion and *C* is the distillation zone. As the gases formed in zone *A*, especially CO_2 from combustion of the refuse, pass over the hot coke and charcoal in *B*, the latter absorbs part of the oxygen and the carbon dioxide is largely converted into carbon monoxide. Moist air is admitted below the grates, not only to assist combustion in zone *A* but also to increase the formation of hydrogen. An average composition of the gas evolved from this process by volume is: CO_2 3.5 per cent, CO 23 per cent, O_2 1.9 per cent, H_2 13 per cent, CH_4 2.1 per cent, N_2 56.5 per cent.

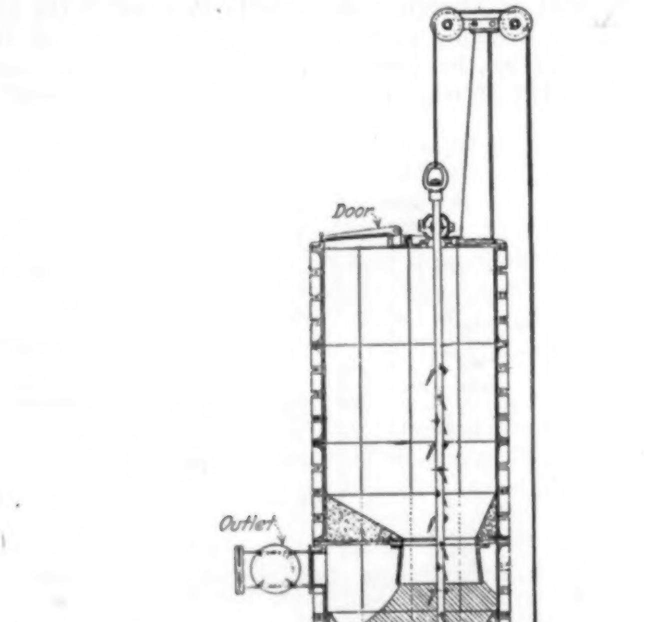


Fig. 3—Carbonizing Plant for City Refuse

This type of producer is operated in zones and equipped with a stirrer, both made necessary when carbonizing mixed city wastes.

Chlorinated Water Suitable for Bread Making

The effect of water containing free chlorine upon bread making has been investigated by the American Institute of Baking. C. P. Morrison, of that institution, reported at the June meeting of the American Association of Cereal Chemists in Minneapolis that the presence of free chlorine to the extent of 5 or 10 parts per million does not appear to have any deleterious influence on the bread quality.

One of the other important subjects considered at the sessions of this association was the quality of gluten. Several papers reported on different phases of this subject, which is one of the most important considerations now before the flour-milling industry. Apparently viscosity measurements are of definite significance as to the quality of gluten, but no general exceptance has yet been found in practice of test methods for determining this characteristic of a wheat or a flour fcr mill control.

What Will Potash Cost the Farmer?

The Effect of the European Tangle on the Price of Potash to the American Farmer and the Possibilities of the Texas Deposits Are Outlined

By J. W. Turrentine
In Charge Potash Investigation, Bureau of Soils

IT WOULD be futile to attempt to predict the ultimate outcome of the present rapidly developing economic and political situation in Germany. The present conflict between the political and industrial groups of France and Germany on the one hand and the employing and laboring groups within Germany on the other offer the possibility of too many eventualities to make speculation profitable. The utter destruction of industrial Germany might conceivably result in the destruction of the scientific organization which now and for years past has made possible the cheap production of potash.

In the first part of this article, published last week, Mr. Turrentine analyzed the production and importation of potash in America. The discussion is completed this week with an analysis of the probable effects of French domination of potash production on American price and of the desirability of an investigation of the subterranean deposits of potash salts in Texas

To date the French have not attained with the potash mines assigned to them that low cost of production which exists in Germany. They have made good progress, it is reported, in mastering the technique of potash production, and while they have certain natural advantages, they have serious disadvantages against which to contend, so that to date they have never been able to match the low German production costs. In Germany the period of rapidly depreciating currency resulted in a rapidly decreasing cost of production of potash, based on the gold standard, without a corresponding decrease in profits. The German miner of potash salts is paid as his wage the equivalent of only meager rations, the barest subsistence. For power generation, lignite has replaced coal. There will be a termination to this state of affairs, with or without the destruction of production efficiency, and there is already to be observed a marked falling off in the efficiency of labor.

But of possibly greater influence on sales costs may be the domination of the German potash producers by the French, which now seems inevitable as a consequence of the present conflict between the French and the German industrialists. The present campaign seems to be designed to force the management of certain German industries to enter into a relationship with France which will end by their incorporation into the French political economy. This domination will certainly not result in a lowering of the sales price of potash. Competition with the Germans in potash production is already proving irksome. French potash properties are operated for profits. French potash miners are paid in real money, while the Germans are not. This is a situation that curtails the profits of the French mines and that will be adjusted as an inevitable consequence of French dominance of German industry. Competition between the German and French industries to which the world looked for cheaper potash and the destruction of the monopoly conditions will not be realized. The further distress of the German miner cannot be counted on much longer to cheapen potash further, as his distress, one would think, approaches the limit.

In the present European situation, then, there is little to be found which can be interpreted to promise cheaper potash, or in fact cheap potash. There is the distinct threat that potash will rapidly increase in price after the present period of low prices, and that in fact monopoly conditions, or at least potash dominance by one nation, will be restored. There is the threat that we may have to deal in the future with a French monopoly where in the past we dealt with the German. There is no promise that the American farmer will be any better off under the latter than he was under the former. It will require the equivalent of the close cooperation among operators, government and merchant marine that formerly existed in Germany to re-establish conditions that are as good.

Particularly there is nothing in the European situation that promises relief to American agriculture from the threat of unrestricted exploitation by foreign potash interests.

To cut us off entirely from our European supply of potash, as was done in the last war, will not now be so easy. It will now be necessary to blockade two nations, where before it was necessary to blockade only one. At the same time the menace is just as great that the nation that dominates the oceans can still again as before cut us off from our potash supplies. This is a state of affairs that must be terminated by the development of our domestic potash industry to a point where it is capable of offering an effective defence against such eventuality. The domestic industry must be capable of the production of sufficient potash at all times to maintain the peace-time prices at a level that will mean only fair profits to the producers and not exploitation of American agriculture by foreigners and also of production in such a way and from such materials that in case of war it can prevent a serious shortage while the industry undergoes an immediate development to the point where the nation's full requirements are met.

The outstanding deposits of potash of the world, such as those formerly owned exclusively by Germany and now owned partly by the Germans and partly by the French, are subterranean deposits, similar in many respects to our own deposits of rock salt and susceptible of mining on a very large scale and by cheap methods. Formerly strata of potash salts were found of such large dimensions and of such a high grade of purity that the potash therefrom could be ground and shipped for direct application as a fertilizer ingredient without further manipulation, thus offering a very cheap product or else a very profitable one. These high-grade strata are now largely exhausted, but the material from the lower grade can still be refined to a high-grade product by a very simple and inexpensive process, so that the situation is not materially altered.

It has been the dream of those interested in the establishment of an American potash industry that we should find in America a deposit that would be comparable to the German deposits. The first reconnoissance for deep sources of potash as conducted jointly by the Bureau of Soils and the Geological Survey was of the saline deposits at that time accessible for examination to see if associated therewith there might not be strata of potash salts or indications that such strata existed. The conditions inducing the deposition of rock salt are those favorable to the deposition likewise of potash salt—arid conditions inducing the evaporation of bodies of sea water with the crystallization of the salines contained therein. Accordingly salt mines were entered and the exposed faces of salt strata were sampled. The brines from salt wells were analyzed and the brines from oil wells, where such were obtainable, and mother liquor from salt refineries—all of which resulted negatively from the potash point of view. Limitations in funds confined these explorations to those salt bodies that already had been exposed by commercial exploitation. They included deposits underlying the states of New York, Pennsylvania, Ohio, Michigan, Kansas and Louisiana. Nowhere was there found any potash in more than traces and nowhere were there indications of associated deposits of crystallized potash. At the same time, it should be remarked, nowhere had the deposits been explored thoroughly for potash deposits. They had been examined only from the salt point of view and with an idea of locating the most favorable stratum for working as a source of salt. Nowhere in America have the great deposits of salines been thoroughly explored for associations of potash, and until this is done in accordance with the most approved methods it will not be possible to say that the more eastern and better known deposits do not contain potash.

Promising Results in Texas

In Texas, however, much more promising results have been obtained. As early as 1912 potash was discovered in a brine taken from an oil well at Spur, in Dickens County, and later in other brines from other localities. Although low in concentration, the indications were that the brine contained the leachings from potash strata or from salt strata containing important concentrations of potash. In 1915 the U. S. Geological Survey entered the field with a test well at Cliffside and since that time has continued its observation of the brine and drillings from the various oil wells put down in the region supposed to be underlain by potash salts. Numerous observations of great interest and importance have been made. Not only have brines containing potash been obtained but crystalline potash salts of recognized mineralogical formation have been identified, indicating definite strata of crystallized potash.

The potash-bearing strata of this region are encountered at workable depths. For their definite exploration it will be necessary to use core drills lubricated with brines of such concentrations that they will not dissolve the potash from the cores secured. The difficulty of obtaining adequate co-operation from commercial oil drillers would appear to make it necessary to inaugurate systematic drilling with potash exploration as the main objective, and the expense and uncertainty attending this would appear to make it imperative that governmental financing be adopted. Only by the sheerest accident in all probability can potash be located otherwise. The great commercial value and national importance of the discovery of workable deposits of potash would amply justify the expenditure.

Unfortunately the supposed potash deposits of Texas are far removed from the present centers of fertilizer application and the cost of potash therefrom would have to include heavy expense for transportation. Also high wages for labor would add a differential prejudical to successful competition with European potash. It would appear to be certainly true that Texas potash could not compete with European potash in the regions of the Southeast, where the bulk of fertilizers are now used. However, these considerations should not be permitted to prevail as arguments against the immediate exploration of those deposits. It is not certain that transportation costs will remain prohibitive and it will certainly come to pass that the custom of fertilizer use as an essential part of good agricultural practice will extend westward and eventually will cover the vast agricultural regions of the Southwest which lie contiguous to the supposed Texas deposits. The use of fertilizers may be regarded as effective in two respects —as a conservation measure, to restore to the soil the plant foods removed with the harvested crops, and as a labor-saving device, to enable the farmer to raise more produce per given amount of labor. The amount of cultivation being the same for a poor crop as for a good one, if the use of fertilizer results in a good crop where otherwise only a poor one would be obtained, it is obvious that the yield per unit quantity of labor has been increased. To disparage the use of fertilizer in the great agricultural regions of the Middle West on the basis that the soils are rich and the yields are good enough without it therefore is as wise as disparaging the use of any other labor-saving device on the same basis. The question is not, "Can I raise good crops without fertilizer?" but rather, "Can I raise better crops with fertilizer, and if so, does the investment in fertilizer yield a profit in soil conservation and increased crop yields?" On this basis and on this basis alone will the geographical limitations of fertilizer use be imposed. When such considerations prevail, the regions of general fertilizer application will not be confined to the Southeast, as at present, but will cover the active agricultural areas of the Middle West. At such a time Texas potash would be the most available and would enjoy a preferential market over the European commodity. Thus the market in part will be brought to the source of supply and will be removed from regions in which the European commodity can compete.

It has been shown that byproduct potash is potentially capable of meeting in large part present American demands. Will there be a conflict between these two potash enterprises, byproduct potash and Texas potash? In answer it may be said that if byproduct potash can compete with the European commodity, it can certainly compete with that from Texas in the present regions of heavy fertilizer application. An import tariff would be an expedient of more benefit to the former than the latter. At the same time a local market developed in the Southwest which would make possible the successful economic exploitation of the Texas deposits would possibly be too remote to be readily and favorably accessible to byproduct potash yielded from the industries now more largely concentrated in the East. The market, it would appear, would automatically divide itself between the two sources and would become adjusted to both without detriment to either.

How the U. S. Can Meet Its Pulpwood Requirements

Consistent Conservation, More Efficient Utilization and Reasonable Reforestation Are Essential—New Pulping Process May Help

PERPETUATION of the pulp industry in this country demands that measures be taken in the immediate future toward the safeguarding and more efficient utilization of existing but depleted pulpwood supplies as well as toward the development of more adequate forest resources that may be drawn on in the future. It is recognized that a grave situation threatens, as pulp plants in certain sections of the country are even now faced with severe hardship in obtaining the essential raw material. There may be a prospect of extinction unless remedial measures are promulgated and adopted.

Being fully aware of these facts, the American Paper and Pulp Association some time ago urged a survey by the Forest Service of the United States that might aid in indicating the necessary steps for the industry to take in protecting itself now and in the future. This survey, conducted in co-operation with the Committee on the Perpetuation of the Pulp and Paper Industry in the United States, has now been completed and the findings made are being released this week in Serial 1241 of the United States Department of Agriculture. The authors of this paper, comprising more than seventy pages, are Earle H. Clapp, Assistant Forester, and Charles W. Boyce, Forest Examiner. It is believed that the recommendations made on the basis of data obtained during the investigation are of far-reaching importance.

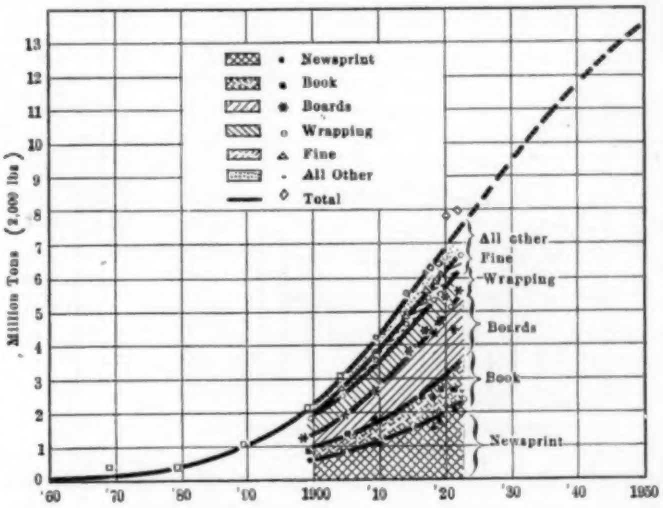
The problem of timber supply for pulp and paper manufacture has become more serious than it is for most wood-using industries. Relatively large plant investments make it much more difficult for paper mills to follow the retreating timber stand than is the case with lumber manufacture. Comparatively few woods have been used in paper making. These factors and the requirements, in one of the most important pulp processes (i.e., groundwood), of abundant and cheap power have so far confined the production of paper to but few timber regions. Pulp manufacture in these regions has in general followed lumbering, and starting with diminished supplies of timber their raw material resources are now scanty. A state has been reached where many pulp and paper mills have no timber of their own or only very limited amounts, and few have permanent supplies.

New Pulp Process Hinted

The number of species which have been regarded as suitable for pulp making has gradually increased, under pressure of high prices because of timber shortage, and as a result of scientific investigations into the pulp-making properties of different woods and into the pulping processes. A new or modified pulping process which would enable pulp from such woods as beech, birch, maple and aspen to compete with mechanical pulp, as from spruce, would revolutionize the situation in northern New England and would greatly relieve the crisis even in New York. It would go a long way at least toward saving the present newsprint industry in these and other states, by affording time to get greatly increased timber growth under way. A process which increased the number of suitable species for sulphite or mechanical pulp, in particular, would be of great value in the solution of our entire future pulp-supply problem.

A series of investigations covering the pulp processes and the suitability of American woods for pulp has been under way in the Forest Service for several years. Preliminary results in one of these investigations justify comment. The wood in this experiment is chipped in the normal manner for chemical pulp; the chips are slightly but uniformly softened by chemical treatment and are then mechanically disintegrated. The high yields of 75 or 80 per cent of the original weight of the wood, the low cost of the chemical treatment and the low power requirements indicate the possibility, in some of the results very recently obtained with hardwoods and pines, that a very satisfactory pulp can be made at a total cost comparable with mechanical pulp.

Spruce typifies the rigid requirements of the mechanical process, but the successful completion of this investigation would permit the substitution in mechanical pulp and hence in newsprint (usually 80 to 90 per cent mechanical pulp) of lower quality woods which are now considered valueless for this purpose. The newsprint mills which experience difficulty in securing spruce and fir pulp wood might be able to turn to the local domestic hardwoods at least during the stringent period of readjustment while growth of the softwood forests is being brought to a maximum. The greater the spruce shortage the greater will be the incentive to turn to this process or to develop one which would accomplish the same purpose. The Forest Service process promises also to make pulp from pine available as a substitute for sulphite. It might also, therefore, with its low power requirements, open up new regions of the United States, like the Southern pineries, as potential areas for the development of the newsprint industry.



Consumption of Paper in United States

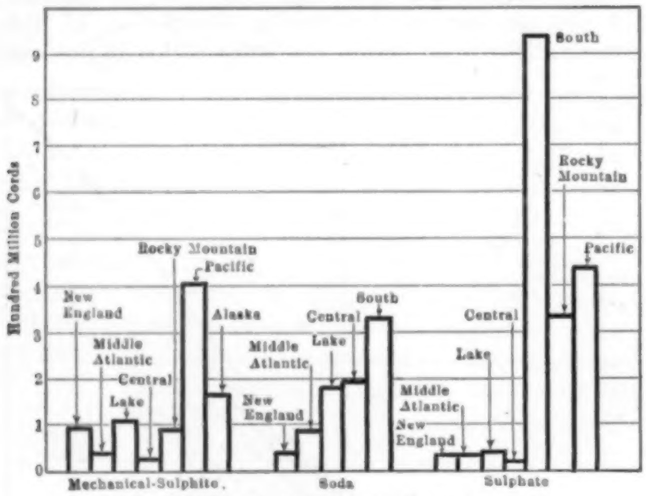
Whether this particular investigation works out commercially in accordance with the promise of laboratory tests or not, it at least serves as an indication of the possibilities of new or modified pulp processes. This indication and the critical need of the industry are ample justification for a large amount of research having the same objective. Some such development may well be the chief means of offsetting any pulpwood deficit

to our present industry until increased amounts can be grown.

Forest Service investigations have further shown the possibility of substituting bleached sulphate pulp made from the pines for bleached sulphite pulp made from spruce. The process is now in commercial use and more general use is possible. Unbleached sulphate pulp could replace much of the unbleached sulphite pulp now used in wrapping papers and boards. Potentially more than 1,000,000 cords of spruce could be released by such replacements.

Why Industry Should Be Protected

There are outstanding reasons for creating a permanent domestic pulp and paper industry which can meet our entire needs, founded on home-grown timber. In the long run this will insure cheaper products to the ultimate consumer than can be obtained from foreign countries. The high productive capacity of our



Remaining Stand of Timber Suitable for Pulp

forest soils, and abundant supplies of other materials than wood essential in pulp and paper manufacture, should make cheaper products entirely feasible.

American paper requirements have nearly quadrupled since 1899 and now exceed 8,000,000 tons a year. They constituted 56 per cent of the world's paper consumption in 1920. Our per capita consumption is double that of any other country.

The enormous growth of paper production and consumption during the past half century has been based upon wood, of which the amount now used exceeds several times that of all other materials together. The paper now consumed in the United States requires 9,148,000 cords of wood. All available information indicates that the supremacy of wood as the chief pulp material will continue.

American forests now supply only 49 per cent of the pulp wood required in our paper consumption, whereas as recently as 1899 they supplied 83 per cent. The increase in imports since 1910 has been almost entirely in pulp and paper.

The forests of practically every region in the United States are being cut much more rapidly than they are being replaced by growth, and in most regions the original timber supplies have been greatly reduced. The regions from which pulpwood supplies are now being chiefly secured fall within the latter class. This situation is the background of the problem of increasing the domestic pulpwood cut sufficiently to meet our requirements.

The most urgent phase of the pulp and paper problem of the immediate future is to secure annually an additional 870,000 cords of spruce, hemlock and balsam, and 180,000 cords of aspen pulpwood from our own forests, to offset pulpwood imports. Purely economic causes make this problem urgent, regardless of any other considerations or possible developments. Closely related to the pulpwood import problem, and only a little less urgent, is the growing shortage of pulp timber in nearly all of the Middle Atlantic, New England and Lake States, which in itself must be faced and met in the near future. The distribution of pulpwood imports chiefly to the Middle Atlantic States, particularly New York, and in lesser amounts to New England and the Lake States, is in itself an indication of the present shortage of local timber supplies.

An important but less urgent phase of the problem is to secure from American forests the pulpwood required to offset present pulp and paper imports. Including the amounts indicated in the preceding paragraph, this would require a total increase in the spruce, fir-hemlock cut of about 3,916,000 cords annually, in the pine-pulpwood cut of 773,000 cords, and in the cut of various hardwoods of 196,000 cords.

The third phase of the problem is to meet increasing future paper requirements from our own forests if possible. This, based upon the increase in requirements of the past decade or two, would necessitate a further increase in the spruce-fir-hemlock pulp-wood cut of 237,000 cords a year, in the pine cut of 110,000, and in the hardwood cut of 23,000 cords. Upon the bases of possible paper consumption of 13,500,000 tons by approximately 1950, there would be required at that time, under present manufacturing practices, nearly 12,000,000 cords a year of spruce, fir, and hemlock pulpwood, 2,000,000 cords of pine, and a little over 1,000,000 cords of hardwood, or a total of about 15,000,000 cords.

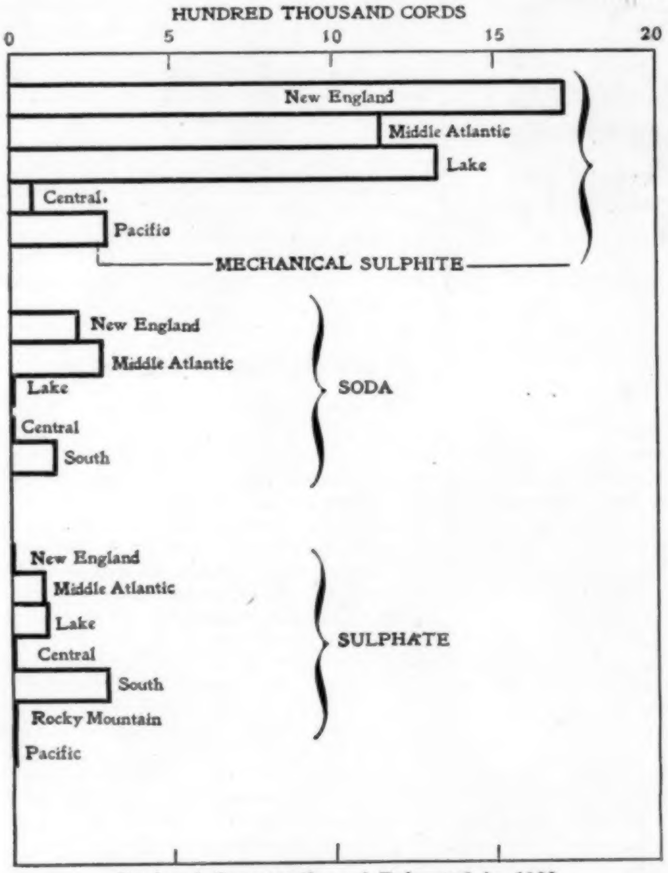
Some relief can be secured in the spruce-fir-hemlock problem by shifting sulphate-pulp production more largely or altogether to pine or larch. Bleached sulphate pulp can also be substituted to a much greater extent for bleached sulphite pulp in book and similar papers, with corresponding reduction in spruce, fir and hemlock requirements. Similarly, unbleached sulphate can be substituted for the sulphite in boards and wrapping paper.

It should also be possible to reduce the pulping waste in the chemical processes, where now in general only about 45 per cent of the original weight of the wood appears as pulp, and to reduce present pulpwood and pulp losses from decay. The refuse of waste paper has grown to 29 per cent of our total paper consumption; but, if need be, it can be made to furnish to new paper much more than its present contribution of 1,850,000 tons a year.

The use of woods and sawmill waste in pulp and paper making has actually decreased during the past 15 years, despite rapidly increasing pulpwood prices. About 20,000,000 cords a year of the sawmill waste in species suitable for pulp cannot be saved in lumber manufacture. Even with a great reduction in lumber cut and large allowance for the mills from which waste cannot be secured, anything approaching the Swedish plan of integrated lumber and pulp industries would permit a vast increase in the utilization of waste over our 1922 total of less than 90,000 cords. Ultimately, with such an organization of industries and utilization as in Sweden, we could nearly double our 15,000,000 cord

pulpwood objective without reducing saw-timber production.

All of these measures have a distinct and important place in the solution of our pulp and paper problem, and full advantage must be taken of them. Through some of them immediate results can possibly be secured to relieve critical situations. The main reliance in ultimately and fully meeting our pulpwood requirements must, however, be placed upon the growing of timber. The possible margin of growth on our present area of forest land, under intensive forest management, over the present drain, would ultimately amount to about



Regional Consumption of Pulpwood in 1920

12,000,000 cords of the pulp species. To this could be added the part of about 11,000,000 cords of pulp species, now lost annually by fire and disease, which it is possible to save under better protection. To both could be added also 2,000,000 cords annually from Alaska. Out of this total could be met the 10,500,000-cord difference between the present cut from our forests and an ultimate cut of 15,000,000 cords of pulpwood, and leave a substantial difference for increased use of other wood products. The chief difficulty would arise out of a continued concentration of requirements on the spruces, firs and hemlocks.

In some regions all of the growth of the types now supporting pulp species would be required to maintain an industry of the size of that already in existence.

The interest of the industry in planning and providing for itself ample supplies of raw materials to meet its own future requirements is still more immediate and direct than that of the public and carries corresponding responsibility for the solution of the pulp and paper problem.

The responsibility of the industry extends to co-operation in the lines indicated—forest protection, forest-products investigations, research at forest experiment stations, and a thoroughgoing timber survey. It includes systematic and widespread efforts to apply the results of research as rapidly as they become available. Further than all of these, the pulp and paper industry should, to safeguard its own interest, assume the leadership in timber growing on its own forest lands and those upon which it is dependent for pulpwood supplies. The alternative of scrapping pulp and paper plants or diverting them to other and less essential product affords no real choice.

The Electrochemical and Electrothermal Industries in the Development of Hydro-Electric Power

By F. A. J. FitzGerald, M.A.I.E.E.

Electrical Engineer, Fitzgerald Laboratories, Niagara Falls, N. Y.

Since the beginning of the last decade of the nineteenth century the use of power for industries depending on electrolysis and the generation of heat by the electric current has increased enormously. For a study of the relation of power to these industries the hydro-electric system of the Niagara Falls Power Co. is eminently suitable, because not only is the extent of that development great but its growth synchronizes with that of these industries in general.

It is doubtful if the promoters of the hydro-electric power system at Niagara Falls counted on supplying large quantities of energy to electrochemical and electrothermal industries, for their idea probably was the selling of electrical energy for miscellaneous uses, such as mechanical power, and for public services such as electric light and railways. The two first large customers, however, were an electrochemical industry manufacturing aluminum and an electrothermal industry manufacturing an artificial abrasive, silicon carbide (carborundum). Current was furnished to these industries in the latter half of 1895, and in the following years the demand for electrothermal and electrochemical industries increased much more rapidly than for public service purposes.

The following table gives some of the principal primary products made in Niagara falls:

Electrochemical	Electrothermal
Aluminum	Ferro-alloys
Magnesium	Calcium carbide
Sodium	Artificial abrasives
Chlorine	Phosphorus
Caustic soda	Graphite
Chlorates	Carbon electrodes

Such electrochemical and electrothermal industries should, for the highest process efficiency, have a 100 per cent load factor quite apart from any consideration that might make it desirable during periods of commercial depression to cut down production.

The great growth of the Niagara Falls hydro-electric development under examination is due mainly to the electrochemical and electrothermal demand. It is also due to the increase in the public service demand. The latter is in part caused by the relatively low cost of the power and this to a large degree is made possible by the great electrochemical and electrothermal demand with its 100 per cent load factor. In the earlier days of the Niagara development the public service demand undoubtedly had a small load factor, probably below the economic limit, so that without the great demand of these special industries the economic benefits of this development would have been of doubtful value and the growth of the system very slow.

Abstracted from paper presented before the World Power Conference, Wembley, London, England, July, 1924.

Equipment News
From Maker and User

Accurate Batch Weighing Equipment

In the manufacture of many chemical engineering products it is necessary that the various ingredients of the finished material be mixed in exact proportions. This is true of many chemicals, both fine and heavy, of plastics, fertilizers, rubber, ceramics, paints, varnishes, food products and numerous other materials. For this reason, equipment recently developed by Stedman's Foundry & Machine Works, Aurora, Ind., for use in making acid phosphate will be of interest in many other industries.

For many years in the fertilizer industry it was customary to weigh the rock that went into the acid phosphate batch and to add the acid by volume.

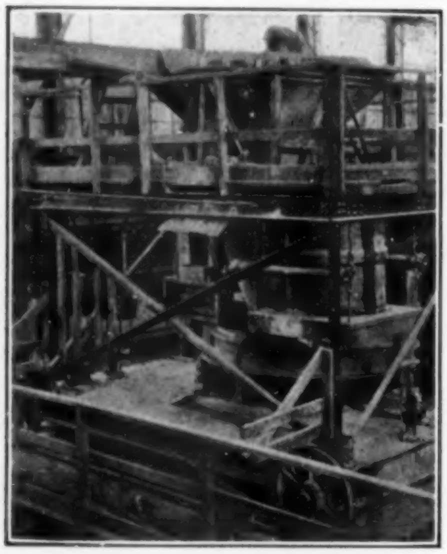


Fig. 1—Installation of Batch Weighing Equipment in Acid Phosphate Plant

This practice is said to have been unsatisfactory and to have resulted in losses. As a result it has become more usual to weigh the acid as well as the rock that goes into the batch. And it was primarily to meet this demand in the acid phosphate field that the Stedman's Foundry & Machine Works installation, shown in Fig. 1, was developed.

This installation consists primarily of a mixing pan mounted on a transfer car that can be moved back and forth across the top of the den—loading one-half while the other is being unloaded. Above the mixer is mounted a storage hopper for ground phosphate rock. This feeds into the automatic weighing hopper, which in turn discharges into the mixer. Just to one side is the automatic weigher for acid, which is fed by a flexible pipe from above and feeds into the mixing pan as desired.

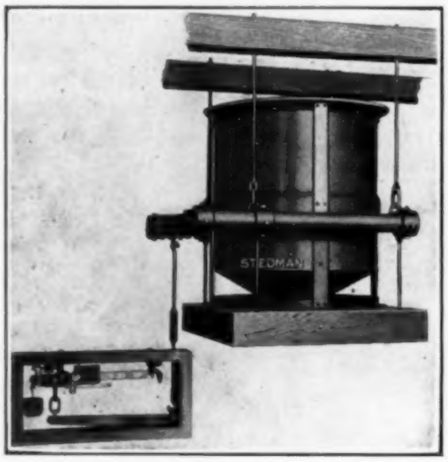


Fig. 2—Liquid Weighing Batcher

This automatic batcher for acids—called by the makers an acid weigh scale—is shown in Fig. 2. In this cut will be seen the acid tank, mounted on a platform which is suspended in a balanced beam scale of the four point suspension type. The knife edges, of best grade hardened steel, are eight in number. The beam is of the full capacity type. It is graduated in pounds and will operate on a 6-oz. load. It is inclosed in a steel box, which can be placed on either side of the tank, as required.

The tank is made of heavy lead and is reinforced on the outside by steel strips sufficiently to accommodate a full charge without the tank being distorted. The bottom is conical in shape, thus insuring that the charge in the tank will completely empty out when the plug valve in the bottom is opened. This latter is of solid rubber and fits into a tapered opening, thus insuring a tight joint. It is operated—usually by hand—by means of a lead-covered rod running through a guide located on top of the tank. The inlet of this tank can be arranged to be operated by the movement of the scale beam.

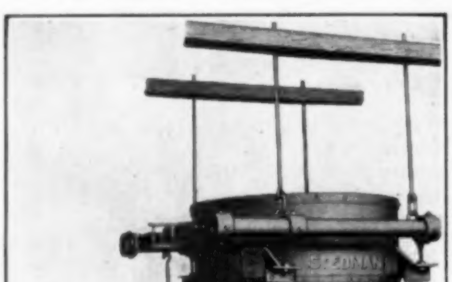


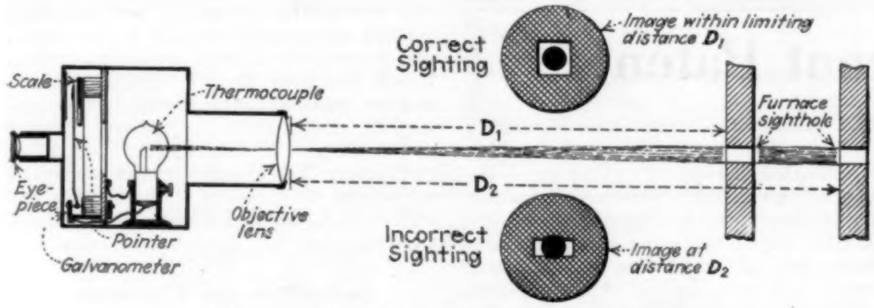
Fig. 3—Dust Weighing Batcher

The weighing hopper for dry materials, shown in Fig. 3, is called by the makers a dust weigh hopper. The suspension and scale are similar to that described for the acid weigh scale. Discharge is by means of a hand-operated gate valve, claimed to be absolutely tight when handling materials up to 150 mesh. This gate can be easily operated with one hand. These hoppers are made in two sizes, 2,000-lb. capacity and 1,500-lb. capacity. Dial scales are furnished in place of beam scales if desired.

Radiation Pyrometer

A new pyrometer has been introduced abroad by the Foster Instrument Co., Ltd., Leeds, England. This instrument, called the "Pyro," operates on the principle of radiant heat. It is a small unit, completely inclosed. The overall dimensions are 7 in. long by $4\frac{7}{8}$ in. diameter and the weight is about 1 lb., 9 oz. It is portable, and is used with a tripod mounting or it can be permanently mounted at the point of use. Because it is used at some distance from the source of heat being measured, it is not subjected to deterioration from high temperatures. It is inclosed in a black enameled case and is supplied with a wooden carrying case with shoulder strap. When it is permanently fixed at a source of heat the temperature of which it is desired to read at some distant point, this can be arranged by connecting the terminals provided by an electric cable to an external indicator or recorder, as the case may be.

The operation is diagramatically shown in the accompanying sketch. Assuming that the temperature of a furnace is desired, the unit may be sighted on the furnace interior either through an open door, or through a "sight hole" as shown. Heat rays emanating through the sight-hole fall upon the objective lens and are focused automatically upon an extremely sensitive thermocouple of minute dimensions mounted in vacuo in a small glass bulb and adjusted in the optical axis of the telescope. Looking through the adjustable eyepiece the observer sees the small thermocouple in the shape of a small black disk, and the larger aperture allows a view of the sight-hole and part of its surroundings also. The position for correct sighting is at once obtained by moving the instrument until the image of the sight-hole well covers the black disk on all sides. The radiant heat from the sight-hole now falls on the thermocouple and develops a proportionate electromotive force that actuates the millivoltmeter, whose



Diagrammatic Sketch of the "Pyro" Pyrometer

pointer is visible on the scale immediately over the eyepiece. Thermocouple, telescope and millivoltmeter are all so designed as to be united in one case within the narrowest compass.

The instrument will operate correctly and independently of distance within wide limits. The standard distance factor is approximately 24 to 1; that is to say, if the sight-hole is 1 in. in diameter, the instrument can be correctly used at a maximum distance of 24 in. away from the sight-hole or at any point within that range. (Special instruments are supplied to increase this distance factor if desired.) As compared with other types of pyrometers at present in existence, this particular design is said to offer accurate service in the measurement of "spot heats" and temperatures of small tools and parts. Within the correct limit, correct focusing is of no importance whatsoever; the only precaution needed in use is to see that the image of the sight-hole well covers the black disk seen through the eyepiece. The cut shows diagrammatically (*a*) a correct image as obtained within the maximum distance limit, D_1, and (*b*) an incorrect image as obtained at any greater distance, D_2, between the sight-hole and the instrument. In the latter case the black disk is not covered on all sides, and low temperature readings would result.

High-Vacuum Pump

A new two-stage high-vacuum pump for such uses as concentration, desiccation, exhausting air in canning and preserving, removing gas from cupolas, removing air from vacuum tubes, etc., has been placed on the market by the Eisler Engineering Co., Newark, N. J.

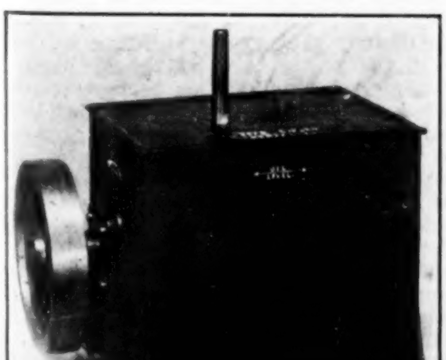


Fig. 1—Two-Stage High-Vacuum Pump

This pump, embodying the good features of other designs and with some added ideas, is claimed by the makers to be efficient, practical and simple in construction and economical in maintenance.

Fig. 1 shows the appearance of this machine and Fig. 2 is a diagrammatic view of the interior. Instead of the two stages being alongside of each other as in Fig. 2, they are actually so placed that stage *B* is in front of stage *A*. The pumps rotate in the direction of the arrows and have a common shaft.

Following through, by reference to the numbers on Fig. 2, the operation of the pump is as follows:

Necessary connections to the object to be exhausted are made at 1, in a suitable manner depending on the work to be performed. The rotating pistons 2 and 2' have sliding blades 8 and 8',

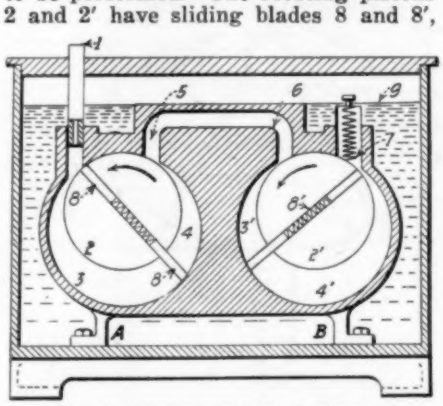


Fig. 2—Diagrammatic Section of Vacuum Pump

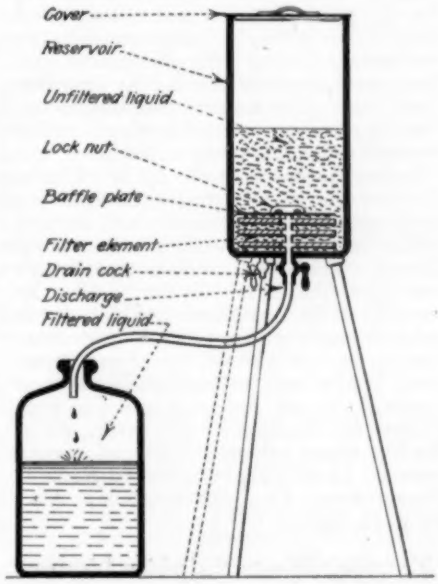
which press against the walls of the two cylinders. With rotation in the direction of the arrows, the volumes 3 and 3' increase while the volumes 4 and 4' decrease, air being drawn through pipe 1. As volume 4 decreases, it drives air into passage 5, whence it is withdrawn into 3' at 6. Volume 4', decreasing, discharges through valve 7, which is submerged in an oil bath, shown at 9, and 8 and 8' are set at the proper angle to maintain 4 and 3' in the correct volumetric relation.

The pump is designed to run at 375 r.p.m. The oil bath should always be a little above all the mechanical parts in level. Rotation is clockwise when one faces the pulley. Horsepower required is $\frac{1}{4}$ hp. when cold and a little less at 45 deg. C. No adjustments are required. Complete weight is 110 lb. General dimensions are 15 in. long by $8\frac{3}{4}$ in. wide by $11\frac{1}{2}$ in. high. Vacuum is produced to 0.0001 mm. on the McLeod gage.

Reservoir Gravity Filter

The Loew "Supreme" filter consists of a glass-enameled, acid- or alkali-proof reservoir, with a filtering element of one or more plates assembled in a single unit. Each filter plate is a solid plate of hard rubber or aluminum. Both faces of the plate are covered with circular grooves, intersected by deeper grooves that radiate from the center of the circumference.

To prepare the filter for operation, a plate is placed on an assembling



Section View of Filter in Operation

stand and the filtering medium is placed on one side, where it is held by a ring or hoop. The plate is then reversed and the other side is prepared in the same manner. After the desired number of plates are ready, they are locked together in a single unit by a nut, and are then placed in position in the bottom of the reservoir.

The liquid is then poured into the filter, and is forced by its own weight through the filtering media and follows the circular grooves to the radial grooves, and from the radial grooves to the hub or center of the plates, where it discharges through the opening in the hub into a receptacle. The apparatus is suitable for any liquid that can be filtered. Information is available from the Loew Manufacturing Co., Cleveland, Ohio.

Manufacturers' Latest Publications

The Jeffrey Mfg. Co., Columbus, Ohio.—Catalog 397. A new, fully illustrated catalog of equipment for cement, stone and allied industries, including conveyors, crushers and grinding machinery.

General Electric Co., Schenectady, N. Y.—A book entitled the "G. E. Farm Book," which is an interesting treatise upon the various uses of electricity on the farm.

Electric Furnace Construction Co., 1015 Chestnut St., Philadelphia, Pa.—A folder illustrating many methods of using electric heating in various industries.

The Thermal Syndicate, Ltd., 350 Madison Ave., New York City—A book entitled "Vitreosil Data," describing the uses of fused pure silica ware in the chemical engineering industries.

Review of Recent Patents

Phosphoric Acid

Bethune G. Klugh, of Anniston, Ala., has called attention to the fact that the reduction of tricalcium phosphate by silica and carbon in an electric furnace requires an energy input of 3,966 cal. for each pound of phosphorus produced. On the other hand, if phosphoric acid rather than phosphorus is desired, the combustion of the 1 lb. phosphorus and the accompanying 2.25 lb. CO liberates 4,929 cal. Substantial economies of electric energy are evidently possible through efficient heat exchange.

In the system proposed by Mr. Klugh, the charge is introduced around the electrodes and the vapors are burned while in contact with the entering charge so as to transfer directly as much of the heat of combustion as possible. The oxidized products then pass through checker work regenerators to coolers and electrical precipitators. These are in duplicate and upon reversal the air for combustion is preheated in the first regenerator, while the hot gases reheat the second regenerator. (1,497,727, assigned to Federal Phosphorous Co., Birmingham, Ala., June 17, 1924.)

Treating Waste Sulphite Liquor

Sulphite liquor as it comes from the digestors is treated with hydrogen sulphide for 8 to 10 hours or until the precipitation of sulphur is complete. After settling, lime may be removed by adding oxalic acid, ammonium sulphate, aluminum sulphate, etc. The resulting liquor may be used as tanning extract, adhesive or binder. (1,497,672, Walter H. Dickerson, Muskegon, Mich., assignor, by Mesne assignments, to Industrial Waste Products Co., June 17, 1924.)

Anhydrous Magnesium Chloride

Chlorination of magnesia in the presence of coke proceeds most effectively at a temperature below that at which magnesium chloride fuses. Instead of the usual 700 to 900 deg. C., Hendrick Bull, of Bergen, Norway, carries out the reaction at 300 deg. C., using a revolving converter. The reaction is exothermic (due mainly to the combination of the coke with the oxygen liberated) and once started, the temperature may be controlled by regulating the rate of chlorine feed. (1,498,-833, assigned to A/S de Norske Saltverker, Bergen, Norway, June 24, 1924.)

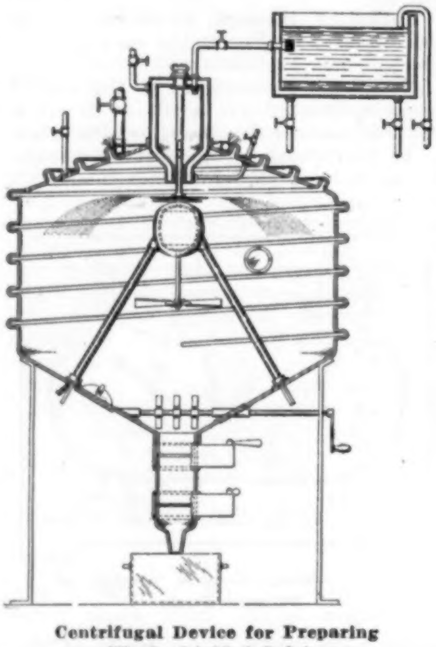
Recovering Gasoline

Nathaniel E. Loomis, of Elizabeth, N. J., has described a process for recovering gasoline from gases or vapors, such as petroleum refinery gases or natural gas. The gases are first scrubbed counter-currently with gas oil or heavy naphtha in a series of absorbers. The residual gas is then passed through a second set of absorbers containing a solid adsorbent such as activated charcoal or silica gel. The adsorbed gasoline is removed by superheated steam, the mixture of steam and gasoline vapor being led to the fire and steam still in which the gasoline and gas oil are also separated. (1,496,061, assigned to Standard Development Co., June 3, 1924.)

Finely Divided Sulphur

Fine sulphur is usually obtained by sublimation or by grinding. A centrifugal method for obtaining uniformly fine particles has been proposed by Joseph G. Coffin, of Hempstead, N. Y. It has the advantage that it may be applied directly to the sulphur as it comes molten from the wells, if desired, thereby reducing the cost of the fine product.

Molten sulphur flows through a steam-jacketed feed nozzle onto a rapidly revolving heated plate. The mechanism is mounted inside a water-cooled chamber so that the centrifugally disintegrated sulphur particles are chilled and settle to the bottom as fine powder. An inert atmosphere, carbon dioxide, sulphur dioxide or nitrogen, is maintained in the chamber, so that a double discharge valve is required. (1,498,717, assigned to Naugatuck Chemical Co., Naugatuck, Conn., June 24, 1924.)



Centrifugal Device for Preparing Finely Divided Sulphur

Chlorhydrins From Still Gases

Recovery of the olefine content of petroleum still gases in the form of chlorhydrins is suggested by Benjamin T. Brooks, of Bayside, N. Y. The gases are passed under pressure through an absorption tower containing an aqueous solution of hypochlorous acid and a water-insoluble solvent for olefines and chlorhydrins. Gas resulting from the distillation of petroleum under pressure and containing about 12 per cent olefines is compressed to 125 lb. per sq.in. and passed into a steel scrubbing tower. Using kerosene as the organic solvent and an aqueous hypochlorous acid solution at about 15 deg. C., there results about 21 lb. of chlorhydrin per 1,000 cu.ft. gas. The chlorhydrin is recovered by steam distillation. (1,498,781, assigned to Chadeloid Chemical Co., June 24, 1924.)

Substitute for Platinum

The composite alloy wire, a substitute for platinum, invented by Colin G. Fink, has been used for some time as a leading-in conductor hermetically sealed into the glass of all types of "evacuated containers" such as incandescent lamps, mercury arc rectifiers, audions, etc. The wire consists of an outer sheath of copper and a core of ferronickel of about 44 to 46 per cent nickel. The thermal coefficient of expansion of the core varies with the nickel content. The 44 to 46 per cent nickel alloy has a coefficient decidedly lower than ordinary glass, whereas the coefficient of copper is almost double that of glass. Accordingly the thickness of the copper shell and the diameter of the ferronickel core of Fink's composite wire are so proportioned as to produce a finished product that has a coefficient of expansion substantially the same as that of glass. Before using the composite wire thus obtained for making seals in glass it may be found desirable to apply to it a coating of a borate. Borax is suitable for this purpose, though zinc borate and other borates also may be used. Zinc borate is non-hygroscopic. The coating protects the wire during sealing-in operations and also facilitates the solution or absorption of the oxide film by the glass. (1,498,908, assigned to General Electric Co., June 24, 1924.)

Pectin Product

In extracting pectin (octo-methylester of pectinic acid) from fruits, hydrolysis of the ester frequently results in a product having low jellifying power.

With these points particularly in mind, Eloise Jameson and Francis N. Taylor, of Corona, and Clarence P. Wilson, of Pomona, Cal., have developed the following method for extracting pectin. Chopped peel of citrus fruit is heated to 100 deg. C. for about 10 min. to destroy the enzymes. After washing, the pectin is extracted by using 0.25 per cent sulphurous acid at 80 to 90 deg. C. The extract is clarified by adding paper pulp and filtering, giving a clear solution containing pectin in colloidal form. By making the extract slightly alkaline with ammonia and adding aluminum sulphate, there is formed a precipitate of colloidal aluminum hydroxide, which because of its opposite electrical charge precipitates the pectin. Aeration causes the precipitate to rise as a scum which is removed, washed and dried. The slight amount of aluminum hydroxide remaining in the dry product is removed by treating with alcohol containing the required amount of hydrochloric acid. (1,497,884, assigned to California Fruit Growers Exchange, June 17, 1924.)

U. S. Patents Issued July 22, 1924

Composition for Fireproofing and Other Purposes. Launcelot W. Andrews, Chicago, and Lewis D. Mathias, Chicago Heights, Ill.—1,501,895.

Fire-Resisting or Flameproof Starching Composition. Lewis D. Mathias, Chicago Heights, Ill., assignor to Victor Chemical Works, Chicago, Ill.—1,501,911.

Fertilizer and Process of Making the Same. Y. Nikaido, Bay City, Mich., assignor to Michigan Chemical Co. — 1,501,914-5-6.

Process of Obtaining Fibers From Bagasse. John K. Shaw, Minneapolis, Minn.—1,501,925-6.

Masonry Construction for Chemical Apparatus. Vern K. Boynton, New York, and Paul W. Webster, Pelham Manor, N. Y., assignors to Perry & Webster, Inc., Elizabeth, N. J.—1,501,938.

Process of and Apparatus for Evaporating Liquids. George A. Krause, Munich, Bavaria, Germany, assignor, by mesne assignments, to American Lurgi Corp., New York, N. Y.—1,501,952.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent office because they appear to have pertinent interest for "Chem. & Met." readers. They will be studied later by "Chem. & Met.'s" staff, and those which, in our judgment, are most worthy, will be published in abstract.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Dry Apparatus. Treadway B. Munroe, New Orleans, La., assignor to C. F. Dahlberg, New Orleans, La.—1,501,966.

Process for Preparing Crystals of Chrome Alum. Peter Hasenclever, Hamburg-Billwarder, Germany.—1,501,035.

Glass-Circulating Mechanism. Leonard D. Soubier, Toledo, O., assignor to Owens Bottle Co., Toledo, O.—1,501,068.

Oven or Furnace. Frank J. Tone, Niagara Falls, N. Y., assignor to Carborundum Co., Niagara Falls, N. Y.—1,502,070.

Method of Revivifying Carbonaceous Filtering Mediums. Moriz Weinrich, New York, N. Y., Dorothea J. E. Weinrich, executrix of said Moriz Weinrich, deceased. 1,502,076.

Process of Making Lead Nitrate and Hydrated Manganese Dioxide. Eric H. Westling, Redwood City, Calif., assignor to Emory Winship, San Francisco, Calif.—1,502,079.

Process of Manufacturing Viscose. Charles A. Huttinger, Lakewood, O., assignor to Acme Artificial Silk Co., Cleveland. O.—1,502,101.

Process of Melting Scrap Metal and Recovering Byproducts Therefrom. George H. Starmann and Henry Lindenberger, Chicago, Ill., assignors to U. S. Reduction Co. —1,502,129.

Apparatus for Separating Solid Particles From a Gas Stream Containing Them. Maurice W Carty, Boston, Mass. — 1,502,135.

Purifying and Deodorizing Isopropyl Alcohol. Matthew D. Mann, Jr., Roselle, N. J., assignor to Seth B. Hunt, trustees, of Mt. Kisco, N. Y.—1,502,149.

Apparatus for Baking or Drying Substances at High Temperatures and for Subsequently Cooling Same. Rowland Greenwood, Carlisle, England, assignor of one-half to Carr & Co., Ltd., Carlisle, England.—1,502,186.

Process for Softening Water. Frank E. Hartman and Harry B. Hartman, Scottdale, Pa., assignors to Electric Water Sterilizer & Ozone Co., Scottdale, Pa.—1,502,188.

Vulcanizing Process and Apparatus. Lee R. McGuire, Chicago, Ill., assignor to Morgan & Wright.—1,502,205.

Electrolytic Process for the Production of Sulphides. Richard Rodrian, New York, N. Y., assignor to Rodrian Electro-Metallurgical Co., Inc., New York, N. Y. — 1,502,213.

Condenser. William Lonsdale, Roselle Park, N. J., assignor to Wheeler Condenser & Engineering Co., Carteret, N. J.—1,502,256-8.

Preparation of Catalytic Bodies. Owen D. Lucas, Westminster, London, England, assignor to V. L. Oil Processes, Ltd., Westminster, London, England.—1,502,260.

Method of and Apparatus for Treating Oil Sand. William McArthur, Seattle, Wash.—1,502,261.

Hydriodide of the Ester of 2-Phenyl Quinoline 4-Carboyxlic Acid. Horace A. Shonle and Asher Moment, Indianapolis, Ind., assignors to Eli Lilly & Co., Indianapolis, Ind.—1,502,275.

Method of Precipitating an Insoluble Sulphide From a Soluble Sulphosalt. Norman R. Wilson, Belleville, N. J., assignor to David A. Shirk, Glen Ridge, N. J. — 1,502,285.

Bearing Metal Alloy. Karl Müller and Wilhelm Sander, Essen, Germany. — 1,502,321.

Filling Apparatus for Presses. Fred S. Carver, East Orange, N J.—1,502,335.

Method of Making Catalyst. Luigi Casale, Rome, Italy, assignor to Casale Ammonia Co. Lugano, Switzerland.—1,502,336.

Manufacture of Cellulose Derivatives. Henry Dreyfus, London, England. — 1,502,379.

Arrangement for Cleaning Filters of Fabric. G. Seitz, Frankfort-on-the-Main, Germany.—1,502,404.

Zirconium Containing Composition and Process of Making the Same. Hugh S. Cooper, Cleveland, O., assignor to Kemet Laboratories Co., Inc.—1,502,422.

Manufacture of Waterproof Paint. David B. Mitchell and George J. Mitchell, Louisville, Ky.—1,502,514.

Diatomaceous Earth Product and Process of Making the Same. Robert Calvert, Karl L. Dern and Gordon A. Alles, Lompoc, Calif.—1,502,547.

Sprinkling Device for Gas Scrubbers, Cooling Towers and the Like. Arthur Kuhn, Recklinghausen, Germany, assignor to Firm Carl Still, Recklinghausen, Germany.—1,502,573.

Process for Preparing Decolorizing Carbon. Johan Nicolaas A. Sauer, Amsterdam, Netherlands.—1,502,592.

Carbonizing and Revivifying Retort. Rafael Vachier, Baton Rouge, La.—1,502,600.

Book Reviews

Absorption of Nitrous Gases

ABSORPTION OF NITROUS GASES, by *H. W. Webb*. 364 pages, 147 figures and curves, 44 tables. Longmans, Green & Co., New York. Price, $8.50.

This book fills a long-felt need among acid manufacturers and chemists. In this volume are collected all the valuable data on nitrogen oxides and nitric acid that have heretofore been hidden away in many inaccessible places. It is a most complete bibliography of the literature on the subject from 1860 to 1923.

The problem of the absorption of nitrous gases is an old one, and an entirely satisfactory solution of it is yet to be found. Progress has been slow, due to the application of rule-of-thumb methods, as is the case with many of our old chemical industries. And in the meantime nitrogen fixation is still as important to us as during the war.

It is with these points in view that the author has handled his subject. The general topics of the book are: Oxides and Oxyacids of Nitrogen, a discussion of the properties and reactions of the materials under consideration; Theory of Absorption, a review of theory and results obtained in practice and experimentally; Apparatus, the description of modern apparatus for handling nitric acid and corrosive gases, including a chapter on the construction of absorption towers. There is a chapter on the analysis of nitrous gases that is of doubtful value, unless read with discrimination.

The value of the book lies in the theory of absorption and the complete discussion of the properties of nitrogen oxides. It is clearly, concisely and logically written. The illustrations, figures and tables are uniformly good and well arranged.

The absorption of nitrogen oxides in sulphuric acid is barely mentioned. However, this is such a large and important subject that another volume could be written on it—if there were one to write it! Nevertheless, the book is of distinct value to the sulphuric acid industry, for much of the discussion and theory applies to that industry, even though it is not mentioned.

The book is to be recommended to anyone having anything to do with the oxides of nitrogen. E. M. JONES.

The Microscope as an Aid

ANALYTICAL MICROSCOPY, ITS AIMS AND METHODS. By *T. E. Wallis*. 149 pages, 45 illustrations. Edward Arnold & Co., London, 1923.

This excellent little book, replete with practical methods and valuable suggestions, was written primarily for the British "public analyst, the analyst in general consulting practice and the pharmacist" who "frequently meet with problems which can only be satisfactorily and completely solved by a skilled use of microscopical methods."

The author has written in a clear and concise manner a much needed book, since, as he points out in his preface, "there is, at the present time, no reliable book to which the analyst can refer for information with respect to the methods employed for the microscopical examination of the numerous miscellaneous substances that are brought in for analysis."

It is obvious that a book of this small compass cannot contain an exhaustive treatment of all the microscopic methods that the analyst may require. The aim of the author has been to select those of most frequent application. This selection has been judiciously accomplished. The discussion throughout is suggestive in tone rather than didactic. The author has thus found it possible to incorporate in the few pages a large amount of information and practical advice not usually found in works dealing with the microscopy of foods and allied products. The book consists of eleven chapters, a carefully selected biblography and a very complete index.

Only a perusal of the book itself will reveal the positive genius of Wallis in fairly cramming his pages with cases explanatory of the microscopic methods set forth. When a reagent or method is mentioned, its particular value is indicated and where necessary illustrations are supplied, these figures are sketches such as the analyst usually records in his note

book, but have been so prepared as to bring out clearly the special points emphasized by the author.

The food analyst will find this little book most useful if he is in search of an outline of methods for the preparation and treatment of material for microscopic examination. Frequent references to original papers and a comprehensive classified biblography add to the value of the book.

E. M. CHAMOT.

Books Received

Technical Organization

THE TECHNICAL ORGANIZATION: Its Development and Administration. By John M. Weiss and Charles R. Downs. 197 pages. McGraw-Hill Book Co., New York. Price, $2.50.

This book deals with the problems that the head of a development or research organization must solve—problems of personnel and organization, problems of chemistry and engineering, problems of salesmanship and accounting. In actual fact they are the same identical problems that the executive head of any departmnet must face and solve and herein lies the essential value of the book. Written by authorities, men who have achieved notable success in the organization and operation of a large development department, it presents a constructive answer to the problems of that department. These problems are specific in their application but are based on the general principles of organization. In fact because the problems are definite and accurately stated they are of unusual value for they bring a new perspective to the executive's aid. The book will of course be of service to the research or development head no matter whether he has one assistant or a department of 50 men. It is to be hoped in addition that operating, purchasing and sales executives will read it because it will give them a better understanding of how research must be handled and also because they will obtain a better conception of organization principles, a sounder idea of interdepartment co-operation and a clearer perspective for operating their own departments.

To the young technical man the book has a personal appeal for it gives him a picture of his organization as a whole and enables him to understand better his present position and its opportunities.

Present Status of Chemistry

CHEMISTRY IN THE TWENTIETH CENTURY. Prepared under the guidance of a committee representing British scientific societies with Dr. E. F. Armstrong, F. R. S., as chairman and editor. 281 pages, illustrated. Ernest Benn Ltd., London. Price, 15s.

By means of a series of monographs there is presented to the reader a statement of the present position of chemical science in Great Britain, as illustrated by the exhibits in the Chemical Hall at the British Empire Exposition. It was prepared in connection with the exposition but is in no sense a handbook or guide to the exhibits. Specialists in each branch of the science have prepared chapters giving a concise summary of present knowledge in the fields covered, which are: The rôle of chemistry in physical science; atomic structure; crystallography; x-ray analysis; rare gases; carbon compounds; organic chemistry; colloids; catalysis; fats and oils; sugars and carbohydrates; cellulose; color in nature; coal-tar colors; terpene synthesis; alkaloids; nitrogenous constituents of living cells; biochemistry and fermentation; agriculture; alloys; pottery and refractories; flame, fuel and explosion; explosives; photography.

New Publications

THE CUNARD STEAMSHIP CO., LTD., 25 Broadway, New York, N. Y., has issued a booklet on "How to Route Freight to and From Inland Points in the United Kingdom." It gives a list of cities in England, Ireland, Scotland and Wales having population over 10,000; counties in England, Ireland, Scotland and Wales; population of the United Kingdom; cities in the same countries having population over 100,000; map of British Isles; Metropolitan boroughs of London; population of Greater London; Port of London Authority docks; Southampton to London service; distances, in miles, by rail between points in England, Scotland and Wales. A copy of the booklet will be furnished on application.

Technical Articles in Current Foreign Literature

Experiments With β-Chlorpropionic Acid, an Industrial Byproduct. *F. Mayer.* Preparation of ketones, pinacones, amine bases and anthrone derivatives. *Z. für angewandte Chem.*, June 19, 1924, p. 394.

The German Wood Preservation Industry, 1838-1924. *F. Moll. Z. für angewandte Chem.*, June 19, 1924, p. 395.

Distillation and Gasification of Lignite. *Arnemann. Z. für angewandte Chem.*, June 19, 1924, p. 398.

Hydrogenation of Coal. *F. Bergius.* Making liquid fuel from coal. *Z. für angewandte Chem.*, June 19, 1924, p. 400.

New Direction of Progress in the Glue and Gelatine Industry. *H. Stadlinger. Z. für angewandte Chem.*, June 19, 1924, p. 400.

So-called Polymerization of Drying Oils. *H. Wolff.* Linseed and other drying oils show no increase in molecular weight after being thickened. *Z. für angewandte Chem.*, June 19, 1924, p. 401.

New Methods in the Soap Industry. *K. Loeffl. Z. für angewandte Chem.*, June 19, 1924, p. 402-3.

Mechanism of Catalytic Saponification. *W. Schrauth. Z. für angewandte Chem.*, June 19, 1924, p. 402.

Theory of Adhesives. *B. Stern. Z. für angewandte Chem.*, June 19, 1924, pp. 403-4.

The Effect of MgO, CaO and BaO on Silicates When Heated, and the Preparation of Metallic Iron From Silicates. *G. Tamman* and *C. F. Grevemeyer. Z. anorg. allgem. Chem.*, June, 1924, pp. 114-20.

Inland Turpentine Production. *Heinrich Trillich.* Recent suggestions for producing turpentine by grinding and distilling stumps are highly impractical. *Chemiker-Ztg.*, June 19, 1924, pp. 410-1.

Catalytic Hydrogenation and Its Applications. *J. v. Braun.* A review. *Z. für angewandte Chem.*, June 12, 1924, pp. 349-52.

Advances in Petroleum Technology. Wilh. Franckenstein. Z. für angewandte Chem., June 12, 1924, pp. 357-60.

Bleach Liquors and the Bleaching Process. *Hugo Kauffmann.* Spontaneous decomposition of hypochlorites; stabilizing effect of neutral salts. *Z. für angewandte Chem.*, June 12, 1924, pp. 364-8.

Statistics of Chemists and Students of Chemistry. *Fritz Scharf.* The number of chemists employed by industrial concerns in Germany increased from 3,089 in 1913 to 3,781 in 1923 and 4,010 in 1924. The number of students is 6.5 per cent less in 1924 than in 1923. *Z. für angewandte Chem.*, June 12, 1924, pp. 368-70.

A Centrifuge Apparatus for Liquids Difficult to Purify, Especially Varnishes. *A. Schmuecking.* A new clarifying equipment brought out by the Krupp works. *Chemiker-Ztg.*, June 19, 1924, pp. 411-2.

Neglected Losses in the Use of Steam. Illustrated. *Chemiker-Ztg.*, June 19, 1924, pp. 412-3.

High Temperature Reactions. *H. von Wartenburg. Chemiker-Ztg.*, June 17, 1924, p. 401.

Kinetics of Cellulose. *Svante Arrhenius. Chemiker-Ztg.*, June 17, 1924, pp. 402-3.

The Constitution of Commercial Iron. *Franz Weyer. Chemiker-Ztg.*, June 17, 1924, p. 404.

Fixation of Carbon Monoxide by Cuprous Sulphate in Presence of Sulphuric Acid. *A. Damiens.* This reaction can be used for making H_2. *Comptes rendus*, June 23, 1924, pp. 2178-81.

The New Hungarian Tariff. Schedules for heavy and fine chemicals, fuels, oils, fats, waxes and resins, adhesives, explosives, dyes and extracts, essential oils, paper, textiles and photographic goods. *Chem. Industrie*, June 28, 1924, pp. 322-6.

Electrical Conductivity of Fused Sodium Hydroxide. *Kurt Arndt* and *Georg Ploetz.* Curves and tables for measurements from 320 to 450 deg. C. *Z. für physikalische Chem.*, vol. 110, pp. 237-42.

Obtaining Alumina From Clay. *H. Specketer.* The HCl process is preferable to the H_2SO_4 process. Germany will be able to supply its own aluminum ore in the future. *Z für physikalische Chem.*, vol. 110, pp. 514-20.

Detonation Limits of Gaseous Mixtures. *Rudolf Wendlandt.* Studies of mixtures of H_2-air, CO-air and CO-O_2. *Z. für physikalische Chem.*, vol. 110, pp. 637-55.

News of the Industry

Summary of the Week

Imports of chemicals and allied products declined sharply in June. Exports also fell off materially as compared with totals for May.

Regulations governing entry of coal-tar products amended so that importers may learn U. S. value for purpose of assessing duty on non-competitive dyes.

All cotton-growing states report an increased use of fertilizer in the past season.

Two-year period of high protective tariff on coal-tar dyes will come to a close on September 22.

New helium plant expected to produce gas at $30 per ton.

Little satisfaction given representatives of pulp industry in Canada regarding government action on embargo.

French chemists are urged to develop motor fuel substitutes.

Electrochemical development foreseen in California when Federal Power Commission permits building of several large dams on Klamàth River.

Change in Regulations Governing Entry of Coal-Tar Products

Regulations governing the entry and appraisement of coal tar products under paragraphs 27 and 28 of the Tariff Act have been amended by the Treasury Department so as to authorize customs officials to inform importers of the United States value for purposes of assessing duty of non-competitive dyes. The original regulations permitted giving information as to American selling price of competitive dyes, but expressly forbade information as to United States value of noncompetitive entries.

The amendment revokes Section (c) of Regulation 4 and changes Section (b) so as to read: "In the case of an actual importation of a similar competitive article, or of a noncompetitive article, the appraising officer may furnish to the importer upon application in writing information of the American selling price or United States value, as the case may be, provided the appraising officer shall be satisfied that the importer, after exercising due diligence, has not himself been able to obtain such information and that he has submitted to the appraising officer all relevant information in his possession. All information furnished by the appraising officer shall be advisory only. In communicating such American selling price or United States value. however, the appraising officer shall not disclose the source of his information."

Importing interests are considered to have gained a decided point of advantage in securing the modification of the original regulations in this respect. The chances for incurring penalties for innocent undervaluation are greatly lessened by the amendment. It will be necessary for the customs officials now to keep more closely informed of the actual sales price of noncompetitive dyes than formerly.

The importers requested this change some months ago. It is understood that Treasury officials consented to the change on the argument that it was inconsistent to give such information in the case of competitive dyes and deny it in the case of noncompetitive entries.

Titanium Chloride Fog Used To Baffle Police

Bootleggers are resorting to the use of the smoke screen to such an extent that many municipalities are adding severe penalties to their traffic regulations for the use of smoke screens as a means of escape from the police. It is stated that the bootleggers usually use titanium chloride to produce the smoke. This usually is introduced into the exhaust by a simple device operated from the rear seat of the automobile.

French Seek New Fuel

The French minister of agriculture is asking industrial chemists to make known any discoveries that may make possible the use of any mineral or vegetable carburants in replacing petrol products from abroad. Those with projects capable of being so utilized are invited to deposit their specifications before Oct. 1, 1924.

One classification is reserved for the treatment and transportation of vegetable oils. The second treats of the liquefaction of mineral combustibles—lignite, shale or peat. Trials will be held of agricultural and other machinery actuated by the derivatives in question at some future date.

Canadian Pulpwood Embargo Regarded Unlikely For Present

Representatives of the pulpwood industry have visited the Canadian capital during the last few days in an effort to get a line on the government's intentions concerning the proposed embargo on pulpwood, but no great light has been shed on the question yet. However, one thing is practically certain, and that is that there is little prospect on an embargo being placed for a considerable time to come.

The government by virtue of an amendment to its regulations of export has the power to prevent the exportation of this commodity, but there are strong influences against it, and the report recently brought down in parliament by the Royal Commission of Enquiry is not suggestive of any speedy move. Nothing in the government's actions at present suggests any immediate move, while it is doubtful if there will be any move at all. The noncommittal character of the commission's findings, the desire to avoid an international controversy, and the general policy in favor of freer rather than restricted trade are considered as pointing to no radical action.

Copper Carbonate Treatment of Seed Wheat

There has been during the past season an increase in the use of copper carbonate by the wheat growers of Minnesota according to the plant disease specialist of the University of Minnesota. The grain is treated in order to control smut and a growing demand for copper carbonate has caused wholesale and retail drug firms in the wheat belt to handle it.

Chemical Imports Decline Materially in June

Exports Likewise Were on Reduced Scale—Start Falling Off in Exports of Coal Tars

Imports of free-list chemicals and allied products declined decisively during June, as compared with May. Free list imports during June were valued at $4,971,223, as compared with $6,279,-677 in May. Dutiable chemicals and allied products valued at $2,332,556 were brought into the country during June, which represents a decrease of some $300,000, as compared with May. A significant feature of the June figures, however, is the fact that imports of coal-tar chemicals were very much heavier than was the case in May. The June total for coal-tar imports was $2,552,015. This is nearly $1,000,-000 greater than the monthly average during the past twelve months.

Colors, dyes and stains were imported in June to the extent of $286,-832. This represents a substantial increase over the May figure. There was a small increase in the value of paints, pigments and varnishes imported during June. The total was $287,393.

An analysis of the crude coal tar products shows that there were no imports during June of benzene or toluene. Imports of naphthalene decreased to an inconsequential amount. Tar and pitch increased and 46,507 pounds of pyridine were brought in, whereas there were no imports in May of 1923. The big upturn was confined to creosote oil which in June entered the country in the unusually large amount of 13,-409,513 gallons. Certain comparisons of imports in June, with imports of June, 1923, are as follows:

	June	
	1923	1924
Formic acid, lb.	180,071	127,013
Oxalic acid, lb.	145,851	180,118
Tartaric acid, lb.	393,332	304,639
White arsenic, lb.	2,365,475	2,072,315
Potassium carbonate, lb.	664,874	571,944
Potassium hydroxide, lb.	1,121,677	870,880
Potassium chloride, lb.	....	260,003
Sodium cyanide, lb.	4,261,795	1,298,029
Sodium ferrocyanide, lb.	69,453	180,659
Sodium nitrite, lb	169,850	1,020,492
Sodium nitrate, tons	27,873	37,440
Creosote oil, gal.	6,111,353	13,409,513
Naphthalene, lb.	1,730,436	112,000

In like fashion there was a decline in exports. The June total covering chemicals and allied products was $8,-853,533, a decrease of nearly $2,000 000 as compared with May and $1,000,000 under the average for the twelve months' period ended with June.

The June figure for coal-tar exports fell to $741,120 as compared with $1,-177,428 for May. The total exports of sodas and sodium compounds were valued at $666,126, which is only slightly less than the May total. Pigments, paints and varnishes valued at $1,245,-240 were sent abroad which compares favorably with the export business done in May. The value of fertilizers and fertilizer materials exported in June was $1,029,260. This represents a loss of nearly $800,000 as compared with May. Sulphate of ammonia sent abroad in June was valued at $301,975, a loss of $65,000. One of the groups showing a measurable upturn was that of explosives, ammunition and fireworks. This total was $223,374 for June.

Comparative figures covering certain of the individual commodities are as follows:

	June	
	1923	1924
Benzol, lb.	14,261,277	4,182,586
Sulphuric acid, lb.	386,573	957,377
Acetate of lime, lb.	3,018,617	3,183,889
Bleaching powder, lb.	2,584,201	2,479,209
Potash, chlorate, lb.	14,043	352,778
Bichromate of potash, lb.	127,493	73,507
Sodium cyanide, lb.	1,120,830	76,057
Soda ash, lb.	2,464,540	2,326,172
Caustic soda, lb.	9,996,569	6,321,297
Sulphate of ammonia, tons	13,187	5,249

Oil and Oilcake Exchange Opens at Marseille

A recent decree signed by the French Ministry of Agriculture, has approved the draft of regulations for the creation of an oil and oilcake exchange at Marseille. This exchange will aid in regulating the local market and minimizing the risks of trading with uncontrolled firms. It was expected that these regulations would go into effect about the first of June. Particular interest in the new market centers on the machinery provided for preventing fictitious sales intended to affect prices, establishing standards, settlement of disputes and the provision for a clearing or settling house through which all transactions involving a time element must pass. The greatest value of the new exchange, however, will be in facilitating the trade by providing a recognized trading center where the buyer will be able to purchase standardized merchandise at the lowest possible rates without the long and difficult process of "shopping around" and where equally the seller will automatically meet all demands coming upon the market, without being in the necessity of sending his salesmen or brokers to all points of the compass in order to dispose of his products. This information is contained in a report from Consul H. A. Doolittle at Marseille.

New Jersey Zinc Co. Plans To Build New Plant

The New Jersey Zinc Co., Palmerton, Pa., will proceed at once with the construction of a new rolling mill on site adjoining the present strip mill at the local plant. The unit has been designed to operate under what is known as the "pack" rolling method, in which the material is handled in a manner different from regular strip rolling, producing wider sheets and of sufficient size to allow utility for practically all purposes where ordinary sheet metal might be used. It will be the first such mill at the works and will have an initial capacity of about 500 tons of rolled zinc per month; it will be built to allow for early future expansion. The plant is expected to give employment to about 60 operatives and will be ready for service early in the coming year. It is said that the mill will complete every branch of zinc production, so far as now known, at the Palmerton and neighboring works of the company.

Canadian Arsenic Production

According to a report just issued by the Dominion Bureau of Statistics the total production of arsenic in Canada during 1923 amounted to 7,344,202 pounds which, at the average price for the year on the New York market at 12.05 cents per pound was valued at 883,771, as against 5,152,000 pounds valued at $321,037 the year previous.

The 1923 production included 6,071,-232 pounds of white arsenic produced by the silver smelters in Ontario, which was all derived from the treatment of the silver-cobalt-nickel arsenides shipped from the mines of the Cobalt area, and 1,262,970 pounds of white arsenic contained in the arsenical gold ores and concentrates exported from British Columbia and Nova Scotia.

Trade Notes

Thomas F. Clifford, referee in bankruptcy for the Atlantic Dyestuff Co. of Newington, N. H., has called a meeting of creditors for August 8, at Portsmouth, N. H.

W. F. Harrington has been made General Manager of the Dyestuffs Department of E. I. du Pont de Nemours & Company to succeed F. W. Pickard, who has been elected a member of the Company's Executive Committee, with general supervision of the sales departments and policies. Mr. Harrington has been Assistant General Manager of the department for three years and has had long experience in the chemical industry. He has been connected with the du Pont Company for nearly twenty years, having joined its forces in 1905, after taking his degree of B. S. as a chemical engineer at the Massachusetts Institute of Technology.

At the annual meeting of the Chemical Salesmen's Association to be held in September, officers will be elected from the following nominations: President, F. P. Summers, George Dunning; vice-president, E. J. Barber, Adolph Schwarz, George Stettner, J. G. Harrison; secretary, C. F. McKenna, W. H. Adkins; treasurer, Hebroun Chamberlain, Robert Quinn; executive committee, John Chew, Ralph Dorland, A. H. Pierce, W. F. Wilmot, George Bode, H. B. Prior.

A report from Paris states that the Chamber of Deputies on July 30 by a vote of 338 to 204 re-established the government monopoly on matches.

New turpentine cups sold to producers for the naval stores year 1923-24 totaled 24,828,500 cups, equivalent to 2,365 full crops; while for the current season, a total of only 13,249,000 cups, equivalent to 1,262 full crops were sold, according to statistics compiled by the Bureau of Chemistry.

Edward Maxson has asked to be relieved as receiver for the American Synthetic Dyes, Inc., of Newark, N. J. Mr. Maxson who was appointed receiver for this company over two years ago, stated that he found no assets of the concern and had no claims presented to him for payment.

Washington News

Consumers Complain About Lack of Domestic Phosphorous

Complaints are reaching Washington from industries consuming small amounts of phosphorous to the effect that domestic producers are unwilling to accept their orders. It is contended that the entire domestic output is going to certain large users. Their contention is that under such conditions the duty of 8 cents a pound on phosphorous should be removed. If after two years of protection, it is contended, the industry shows no disposition to expand to the point of meeting American requirements, the duty should be removed.

Gen. Fries, of the Chemical Warfare Service, has quite another idea. He regards it as essential to the national defense that phosphorous production be kept alive in this country.

At one time the United States had a phosphorous industry capable of meeting all domestic requirements. Foreign producers attained a capacity in excess of their immediate requirements and made a campaign for the domestic market. They offered a superior grade of phosphorous at a price below the cost of production in this country and gradually forced the industry to the wall. It is pointed out that many of the consumers now complaining were among those who assisted the foreign producers to wreck the American industry. After the American industry had been curtailed, prices were advanced and consumers soon reimbursed foreign producers for any losses they sustained during the campaign which they waged. They are continuing to be affected adversely by the situation, it is declared, because the existing duty is not high enough and its continuance is too uncertain to encourage the domestic producers to expand to the point necessary to meet all requirements. As a result these particular consumers are forced to pay a good round price for the foreign product to which they must add the eight cents duty. This case is cited as an example of the hardship which is laid upon producers and consumers alike by an inadequate rate of duty.

Chemical Trades Will Oppose Proposed Alcohol Legislation

Full advantage is being taken of the interim between the sessions of Congress to marshal the chemical industries behind the opposition in the creation of a separate bureau of prohibition in the Treasury Department. It is regarded as imperative that this legislation be defeated to prevent the unloading of new hardships on the legitimate producers and consumers of industrial alcohol.

The hope is to secure hearings before the Senate committee. When the House passed the bill near the close of the last session, the measure was rushed over to the Senate. Formal consideration of the measure was not given it by the committee on the judiciary in the upper House but a poll was made of the members of the committee, and permission secured to report the bill favorably. While members of committees will consent to such informal procedure in the face of the exigencies of the closing hours of a session, it is regarded as entirely probable that since the bill failed and ample opportunity now is afforded to allow the measure to take its usual course, that the committee will request that it be recommitted. In that event, hearings could be held and an opportunity afforded the chemical industry to present its objections to the measure.

Paint Consumption Stimulated By Installment Sales Plan

The use of paint is being stimulated greatly by the application of a "pay over the year" plan. The application of the installment payment principle to paint purchases is regarded as being particularly timely since high rents have had the effect of encouraging the purchase of homes on the part of persons of small means. Many of these houses have been purchased on a deferred payment plan. With the pride which goes with ownership, it has been found that there has been a general tendency to maintain the property in good condition. In many instances, however, the owners have not been in a position to make the cash payment which would be entailed in the repainting of the house. In this deferred payment plan, the dealers in paint are co-operating with the master painters so that the labor charge also is met on a deferred basis.

The paint industry has learned how to turn a strike or unemployment to its advantage. By a liberal use of local advertising in places where a strike is in progress, the workmen are induced to take advantage of their enforced idleness to paint their properties. It also has been found that employment can be furnished many men by stimulating a paint-up campaign just at the time that there is a surplus of workers.

French Copra Handlers Lose on Fluctuations in the Franc

The vegetable oils industry of France with its center at Marseille, suffered probably as much as any of the important activities from the recent exchange fluctuations. Heavy shipments of raw materials, especially copra, were in the hands of importers at the time the stiffening of the franc occurred. The contracts by which these were purchased were largely made during the decline period of the franc. The losses sustained are variously estimated at up to 40,000,000 francs. Most of these were by first-class houses, and only one firm—that of secondary importance—was unable to weather the crisis. The market is now quiet and it is expected will steadily improve if confidence develops.

Geologist Investigates Arsenic Supplies in Western States

Victor Heikes, geologist on the staff of the U. S. Geological Survey, recently completed a trip through Montana, Nevada and California, to secure more accurate data as to the sources of arsenic ore and as to the plants engaged in the manufacture of calcium arsenate. He found the Martinez plant of the Chipman company, near San Francisco, operating at full capacity. It is drawing its arsenical ores from California, Nevada, Washington and New Mexico. The ores include realgar and orpiment. These ores are being treated without trouble. It has been demonstrated at that plant, it is pointed out, that it is possible to adapt one plant to various ore, provided the operators are willing to employ the necessary metallurgical and chemical skill.

Dispute Priority of German Disinfectant

Claims being made that the German product known as "uspulun," a mercuric disinfectant used in combating surface-borne seed and plant diseases, is a German discovery, are in error, according to American chemists. They point to the du Pont company's "semesan," widely used for the same purpose, as having been the earlier development. Apparently the disinfectants are of much the same character. The active ingredient in semesan is hydroxymercurichlorophenolsulphate. The toxicity of this compound to fungous and bacterial life on seeds and plants make it possible to attain a greater rate of growth and more vigorous plants. The American desinfectant was developed by the du Pont company in co-operation with many agricultural agencies.

New Helium Plant Expected to Produce Gas at $30 per Ton

The Bureau of Mines' semi-commercial helium plant will continue to operate during the time that the Navy's large plant is under construction. This plant, which is to have a capacity of 1,500,000 cubic feet of gas per day, was designed by the Bureau of Mines, along the lines of the semi-commercial plant. It is estimated that this plant will make possible the production of helium at $30 a thousand feet.

Helium production now is proceeding at a rate in excess of 500,000 cubic feet per month. The month's output has been as high as 1,000,000 cubic feet. This gas is stored in cylinders. The capacity of each cylinder at 1,800 pounds per square inch pressure is 200 cubic feet. The problem of this type of storage is emphasized when it is considered that 2,150,000 cubic feet are required to fill the Shenandoah.

In view of the objections being raised to the legislation necessary to the conservation of helium, it is of interest to note that Canada recently has adopted a much more stringent leasing act than ever has been proposed in this country, pending a thorough field survey for helium. The Canadian government is taking vigorous steps to push its exploration program.

News in Brief

Boiler Refractory Service Tests Under Way — Observations are being made by Department of the Interior engineer, in the vicinity of New York City in the course of a survey of refractory service in boiler-furnace plants being made by the Bureau of Mines. Observations were recently made at Providence and Pawtucket, R. I., and near Boston, Mass. This survey gives promise of definite results in promoting the interest of power-plant engineers in refractory problems and in the obtaining of co-operation of research organizations in solving these problems.

Canadian Saltcake Use Expanding—Canadian salt cake will be used exclusively in the Dominion in a very short time, according to a prediction by E. N. Todd, freight traffic manager of the Canadian Pacific R.R. The sulphate mills in Ontario and Quebec are at present using 45,000 tons yearly. Customs reports show that imports of this material during the last fiscal year totaled 68,009,505 pounds, valued at $686,149. Canadian deposits are in Saskatchewan and Alberta.

Rich Potash Find Reported — The Texas Development Co., operating near Midland, Tex., has discovered what is said to be the richest deposit of potash yet found in the state. The boring tests show a potash stratum to a depth of 710 ft. The company is planning for extensive development of the tract, and will place machinery for this purpose at an early date.

Wide Paper Machines Embarass Wire Makers—The very wide newsprint machines now being installed by many of the Canadian mills have created a demand for wire cloth beyond the capacity of many of the wire weaving plants in Canada. The Niagara Wire Weaving Co. which manufactures wire cloth for pulp and paper machines, has found it necessary to build an addition to their plant 240 by 50 feet, two stories high, in which looms will be installed to permit the manufacture of the wider cloth for the wide newsprint machines.

Air Reduction Plant at Harrisburg Nearly Complete—The Air Reduction Co., Inc., of New York, has completed the first unit of its new plant at Harrisburg, Pa., and will develop full production at an early date. The works will be used for the manufacture of commercial oxygen, and is said to represent an investment of close to $250,000.

Canadian Fiber Silk Plant Started—Construction has been started on the big artificial silk plant of Courtaulds, Ltd., which is being erected in Cornwall, Ont. This plant will be the first in Canada using Canadian woodpulp for artificial silk fiber. The plant will cost in the neighborhood of $1,500,000 and will employ about 500 hands.

Gypsum Plant in Virgania Under Construction—The United States Gypsum Co., Chicago, Ill., has commenced operations at its new plant at Plasterco, Va., making the second such works to be placed in service within the past few weeks, the other being located at Sweetwater, Tex. The Plasterco mill has been in course of building for about 7 months past, and will be given over largely to the manufacture of gypsum wallboard products; it has a rated capacity of 100,000 sq.ft. of such material per day, and represents an investment of approximately $400,000. The company has plaster mills in this same district, as well as mines for raw material supply, and the new plant makes a complete producing unit for gypsum building products at this place. The present working force will be advanced until maximum production is reached.

Coke Plant in New Brunswick Planned—Announcement has been made by Stanley E. Elkin of the intention to establish a large coke plant in St. John, New Brunswick, in the very near future. This plant it is stated will involve an investment of considerably more than a million dollars and will be one of four plants in Canada. The new industry, Mr. Elkin states, will start this fall, and the head office will be opened at Montreal immediately.

Radium Lab Transferred—The Bureau of Mines radium laboratory has been set up in Washington after its transfer from Reno. This change in the location of the laboratory was made so that the work could be under the personal supervision of Dr. S. C. Lind, the Bureau's chief chemist. The principal problem on which work is being done at this time is in the matter of the effect of radium radiation on carbon compounds.

Coke Plant To Be Built In Hudson Valley

The Hudson Valley Coke & Products Corp., Troy, N. Y., affiliated with the Burden Iron Co., of the same place, has awarded a general contract to the Foundation Co., New York, for the erection of its proposed byproducts coke plant on site selected near Troy. The contracting company is also financially interested in the Hudson Valley company. The works will include an auxiliary water-gas plant for the manufacture of artificial gas for distribution for commercial service at a number of communities in this district, including Troy, Albany, Cohoes and Schenectady, with the Adirondack Power & Light Corp., acting as the distributing organization of the project. The last noted company will build a high-pressure pipe line for this purpose, estimated to cost $350,000. The Burden Iron Co. is perfecting plans for the complete modernization of its present blast furnace, to include the installation of considerable machinery and facilities for increased output, estimated to cost close to $1,000,000.

Duty on Coal-Tar Dyes Will Be Lowered in September

Apprehension Felt by Domestic Industry as Two-Year Period of High Protective Tariff Draws to a Close

The approach of September 22 is being watched with apprehension by the coal-tar dye industry as on that date the protection enjoyed by the industry will be reduced from 60 to 45 per cent. While the industry has made remarkable strides during the 2 years that it has enjoyed this protection, it has not become so established that this reduction can be regarded other than seriously. Unfortunately the domestic industry has not taken full advantage of the amount of protection offered since competition between domestic producers has led to destructive price cutting on certain items. Nevertheless very material benefits have come to the industry by reason of these duties. Production in 1923 was 50 per cent greater than that during 1922. That the dye manufacturers have been faithful to the trust which Congress placed in them is indicated by the fact that the price level has moved constantly and consistently downward since the enactment of the law.

The great regret being expressed is that the duty was not made effective for four years. Had that been the case, it is believed it would have entrenched itself so securely that a lowering of the rate duty would have been a matter of little concern. In its short life the American dye industry has come to rank second only to that of Germany. One of the leading figures in the German chemical industry, now in the United States, told an official of this Government last week that Germany regards the progress of America's organic chemical industry as one of the most remarkable developments of the post-war period. He declared that German chemists see in the United States a real contender for the chemical markets of the world.

The unusual expedient of extending a rate of duty for a two-year period only was a step toward mollifying the textile industry. The dye producers feel that another regrettable feature of the situation is the fact that there could not have been more cooperation and more vision displayed by the consumers of dyes. Success in the industry's struggle for existence, it is said, could have been assured had it not been for the lack of vision displayed particularly by the textile and tanning industries. Many consumers of dyes, it is declared, could have cut their color costs in half had they been willing to eliminate waste and make the full use of all their dyestuffs. Instead there has been a general disposition to place all possible obstacles in the way of the domestic dye producers. Some consumers have gone to the length of patronizing the bootlegger who finds abundant opportunity for profit when it is considered that certain concentrations of dyes are worth more than $100 per pound.

Men You Should Know About

EDWIN P. ARTHUR is now employed as consultant to the Pittsburgh Sheet Glass Co., of Washington, Pa., as well as the United States Window Glass Co., of Morgantown, W. Va.

HENRY C. BERGER has resigned from the research staff of the U. S. Bureau of Mines to take the position of research chemist for the Armstrong Cork & Insulation Co., Gloucester City, N. J.

C. M. CARSON has been appointed acting president of the Michigan College of Mines, Houghton, to succeed the late Dr. F. W. McNair. Dr. Carson has been director of the chemistry department at the college since 1913.

D. B. DOW, heretofore at the Petroleum Experiment Station of the Bureau of Mines, has been appointed engineer in charge at the new station now being established at the University of Wyoming, Laramie.

CHARLES G. DURKEE, who has been refinery superintendent at Fort Worth for the White Eagle Oil & Refining Co., was transferred on Aug. 1 to Augusta, Kan., to be superintendent of the company's refinery at that place.

E. W. EDWARDS has been elected president of the Paragon Refining Co., Toledo, Ohio, petroleum refiner, succeeding L. R. Crawford, who has acted in this capacity for the past 3 years. Mr. Edwards has been a director of the company for some time past, and is also president of the Edwards Manufacturing Co., Cincinnati, Ohio.

R. C. GOSROW, metallurgical engineer and electrometallurgist of Chicago, Ill., has changed the spelling of his name to conform to the old family name of Gosreau, which he is now using.

Colonel H. A. METZ was the principal speaker at a dinner given by the Northern New England Section of the American Association of Textile Chemists and Colorists, at the Merrimac Valley Country Club, Methuen, Mass., July 10.

B. M. O'HARA has been appointed acting superintendent at the Mississippi Valley Station of the Bureau of Mines, Department of the Interior, at Rolla, Mo., to succeed C. E. VanBarneveld, resigned.

H. C. PARMELEE, editor of *Chem. & Met.*, has returned to the office after a 6 weeks trip which took him to the Pacific coast.

F. W. PICKARD, general manager of the dyestuffs department of E. I. du Pont de Nemours & Co., Wilmington, Del., has been elected a member of the executive committee of the company, with general supervision of sales departments and policies. He will be succeeded as general manager by W. F. HARRINGTON, who has acted as assistant general manager of the department for the past 3 years. Mr. Harrington has been connected with the organization for the past 19 years, joining its forces in 1905, following the taking of his degree of B.S. as a chemical engineer at the Massachusetts Institute of Technology. He has had a wide experience in the chemical industry, as well as in the manufacture of explosives, having spent about 10 years at company plants of the latter character in the West. At one time he was superintendent at the explosives plant of the company at duPont, Wash., and later assistant manager, and then manager at the smokeless powder works at Carneys Point, N. J.

R. F. RUTTAN, director of the department of chemistry, McGill University, has been appointed to succeed Dr. F. D. Adams as dean of the faculty of graduate studies and research.

PHILIP E. STONEHOUSE is now a member of the chemical division of Procter and Gamble's Port Ivory plant.

A. C. WOODMAN has resigned as vice-president of the Sinclair Consolidated Oil Corporation, New York, remaining as a director of the company. He was formerly president of the Union Petroleum Co., purchased a number of years ago by the Sinclair interests.

Calendar

AMERICAN CERAMIC SOCIETY, Los Angeles, Cal., Oct. 6 to 7.

AMERICAN CHEMICAL SOCIETY, sixty-eighth meeting, Cornell University, Ithaca, N. Y., Sept. 8 to 13.

AMERICAN ELECTROCHEMICAL SOCIETY, Detroit, Oct. 2 to 4.

AMERICAN FOUNDRYMEN'S ASSOCIATION, Milwaukee, Wis., Oct. 11 to 16, 1924.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, Birmingham, Ala., Oct. 13 to 15.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, New York, Dec. 1 to 4.

AMERICAN SOCIETY FOR STEEL TREATING, Boston, Sept. 22 to 26.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Toronto, Aug. 6 to 13.

FRANKLIN INSTITUTE CENTENNIAL, Philadelphia, Sept. 17 to 19.

INTERNATIONAL MATHEMATICAL CONGRESS, Toronto, Aug. 11 to 16.

MANAGEMENT WEEK. Auspices of American Society of Mechanical Engineers, New York City, Oct. 20 to 25.

PACIFIC COAST GAS ASSOCIATION, Santa Barbara, Calif., Sept. 15 to 19.

Obituary

JOHN HENRY CREMER, senior member of the Cremer-Case Co., Cleveland, Ohio, analytical chemist, died at his home at Spartanburg, S. C., July 20, aged 80 years. For a number of years he was prominently identified with the steel industry, and is said to have been the first man to produce ferromanganese on a commercial scale in the United States, entering competition with the importations of the material from England. He was at one time actively engaged in the analyzing of ores from districts in the vicinity of Cleveland. Mr. Cremer resided at Spartanburg for the past 7 years.

JOHN H. DUNLAP, secretary of the American Society of Civil Engineers, died July 29 at the Presbyterian Hospital, Chicago, as a result of injuries received in the train wreck near Buda, Ill., June 30. Mr. Dunlap was born at Harrisville, N. H., Sept. 9, 1882. He was graduated from the Thayer School of Civil Engineering of Dartmouth College in 1908. After graduation he joined the faculty of the State University of Iowa, where he became professor of hydraulics and sanitary engineering in the college of applied science. At the Portsmouth, N. H., meeting of the society, June, 1922, he was elected secretary.

EDWARD D. HOWARD, president of the Howard Brothers Chemical Co., Buffalo, N. Y., died at his home in that city on July 20, following a brief illness of heart trouble, at the age of 60.

HAROLD C. JONES, a graduate of Cornell University and formerly vice-president of the Inland Steel Co., Chicago, Ill., died at his home in that city on July 21, following a few days illness of pneumonia. At the time of his death, he was president of the Mid-West Forging Co.

WILLIAM B. LEWIS, Highland Park, Chicago, Ill., for many years connected with E. I. du Pont de Nemours & Co., Wilmington, Del., died at Yellowstone Park, Wyo., July 18. He was born at Kenosha, Wis., in 1852, and became identified with the explosives industry in 1881, with the Aetna Powder Co., of which he later became vice-president. Subsequently he was vice-president and then president of the Forcite Powder Co., which was merged with the du Pont organization in 1903. From that time he was associated with the last noted company in various managerial capacities until his retirement from active business in 1918. He was at one time general superintendent of the blasting supplies division of the explosives manufacturing department of the company.

Increased Use of Fertilizer in Cotton-Growing States

Approximately 2,090,000 tons of fertilizer have been used on the cotton crop this year, the Department of Agriculture estimates. Increased use of fertilizer is reported from all the cotton-growing states. Georgia used 483,000 tons this year; North Carolina, 406,000 tons; South Carolina, 358,000 tons; Alabama, 334,000 tons; Mississippi, 150,000 tons, and Texas, 109,000 tons.

It is estimated that fertilizer this year has been used on 39 per cent of the cotton acreage, as compared with 37 per cent last year, and 31½ per cent in 1922. Fertilizer was used on 99 per cent of the cotton acreage in North Carolina; 98 per cent in Virginia; 95 per cent in South Carolina and Georgia; 91 per cent in Florida; 88 per cent in Alabama; 50 per cent in Louisiana; 45 per cent in Tennessee; 35 per cent in Arkansas and on small fractions if any of the acreage in other cotton states.

The average cost of fertilizer per cotton acre this year was as high as $6.03 in Virginia; $6.01, in North Carolina; $4.38 in South Carolina. The cost in Georgia was $3.64, and less in other states. The lowest cost per acre was $2.17 in Missouri.

Call for Chemical Products Gains in July

Moderate Improvement Follows as Result of Better Conditions in Consuming Industries

While demand for chemicals continued along quiet lines during the past month, the movement from producing centers was reported to be larger than in June. More favorable reports were heard regarding activity in industrial lines which are consumers of chemicals. Textile mills were operating on a larger scale and the same was true of plants engaged in paper manufacture. Soap makers were in the market for raw materials with more regularity and production of glass showed material expansion.

Curtailment of production on the part of manufacturers of chemicals was adhered to and, with few exceptions, stocks of finished products at primary points have not been oppressive. Assuming that production varies proportionately with the number of workers employed, the output of chemicals and allied products in June decreased more than 5 per cent as compared with the preceding month. On the same basis, comparisons of production in January and in June, show the following:

	Number Employed Jan.	Number Employed June	Per Cent of Change
Chemicals and Allied Products	71,500	63,403	—11.3
Fertilizers	8,153	4,720	—42.1
Petroleum Refining	44,844	42,086	— 5.1
Dyeing and Finishing	21,022	26,697	+26.9
Leather	27,649	22,677	—17.9
Automobile Tires	43,094	46,574	+ 8.
Paper and Pulp	50,872	50,964	+ —
Glass	32,790	35,201	+ 7.3

Chem. & Met.'s weighted index number places the average for prices in July at 157.48, which compares with 153.62 for June and 152.95 for May. The upward swing to values was again attributed to fluctuations in allied products with chemicals showing no decided price tendency. Selling pressure was still noted in some selections and caused an irregularity in prices. This pressure, however, was less pronounced than in preceding months—and there was evidence that, outside of dips caused by occasional distressed lots, that values were not susceptible to further declines without going below production costs.

Export Trade Quiet

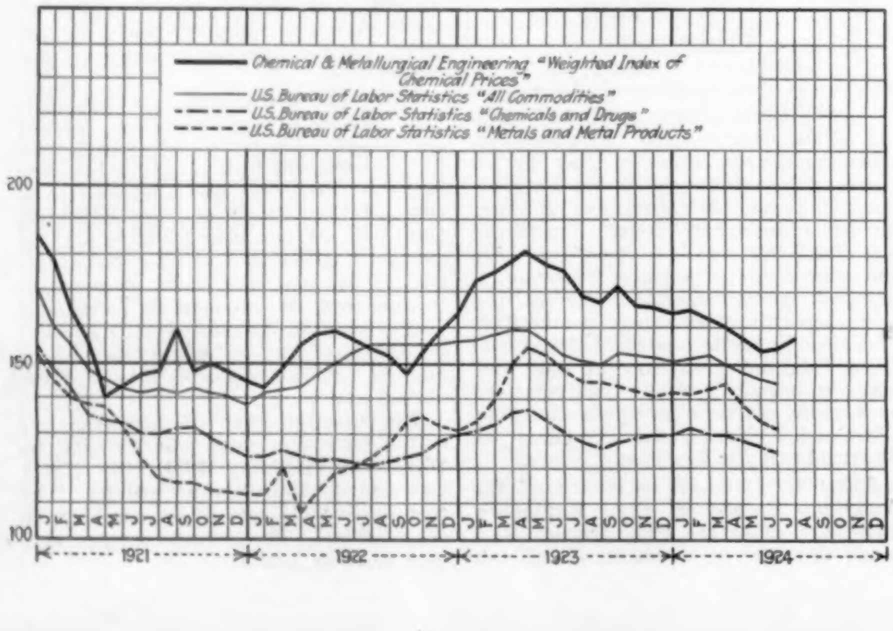
Export trade in chemicals in July was reported to be quiet, but no official returns are yet available. Department of Commerce figures reveal that outward shipments in June were decidedly lower than in May, the difference in value being nearly $2,000,000 in favor of the latter month. Arrivals of chemicals from abroad also declined materially in June.

The Bureau of Labor reports that a further recession in the general level of wholesale prices is shown for June by information gathered in representative markets. The Bureau's weighted index number, which includes 404 commodities or price series, sank to 144.6 for June, compared with 146.9 for May and 153.5 for June, 1923. Chemicals and drugs declined to 126.6 in June as compared with 127.3 for May, and metals and metal products are represented by 134.5 and 132.2 for May and June respectively.

Electrochemical Development Predicted in California

After nearly four years of deliberation, during which time considerable opposition was encountered on the part of the Fish and Game Commission, the Electro-Metals Co., of San Francisco, has been granted preliminary permits by the Federal Power Commission for the construction of three power dams on the Klamath River, in Northwest California. The permits have been granted on the condition that a plan is developed for the protection of salmon.

The proposals submitted provided for the diversion of sufficient water from the Klamath River at Ishi Pishi Falls and at a lower point for the development of about 150,000 hp. The power is to be transmitted to Trinidad, a new harbor, to be used for the manufacture of electrometallurgical and chemical products, with particular reference to iron and aluminum. Cheap ocean transportation will be a factor in supplying raw materials for the plant.



Financial

For the quarter ended June 30, the Air Reduction Co., Inc., reports net profit of $514,818 after interest and depreciation, but before federal taxes, equivalent to $2.69 a share earned on 190,871 no par shares of capital stock. This compares with $597,033, or $3.13 a share in preceding quarter and $728,458, or $4.22 a share earned on 172,529 shares outstanding in second quarter of 1923.

The New England Spun Silk Corporation of Boston, Mass., has voted to issue new stock in the amount of $1,200,000, including 4,000 shares for cash and 8,000 shares in exchange for an equal number of shares of preferred "B" stock held in the treasury.

The Ohio Leather Co. in first half of 1924 showed net earnings of $58,000, only $2,000 short of combined dividends on the 7 per cent and 8 per cent preferred for the period. Company paid regular dividends on the 8 per cent preferred.

The National Lead Co. has declared regular quarterly dividends of $2 on common, payable September 30 to stock of record September 12, and 1¾ per cent on preferred, payable September 15 to stock of record August 22.

The Corn Products Refining Co. reports for 6 months ended June 30, net income of $5,428,336 after charges, depreciation and federal taxes, equivalent after preferred dividends to $1.82 a share earned on the outstanding $62,500,000 common stock.

E. I. du Pont de Nemours & Co., for 6 months ended June 30, reports net income of $7,610,089 after expenses, interest, discount, etc., equivalent after debenture stock dividends to $5.84 a share earned on $95,060,900 outstanding common stock, as compared with net income of $10,125,882, or $8.54 a share, in corresponding period of 1923.

Du Pont Perfects New Dyes

Two new acid colors of exceptional fastness to light have just been placed on the market by the dyestuffs department of E. I. du Pont de Nemours & Co. The new colors are known as Pontacyl Light Red BL and Du Pont Alizarine Saphirole SE. Pontacyl Light Red BL is one of the fastest to light acid reds known. It is a bright red of bluish shade. Du Pont Alizarine Saphirole SE is a brilliant acid blue, which possesses very good fastness to light, water and acids. It is easily soluble and dyes evenly.

The du Pont Company has also just placed on the market a new direct color, known as Pontamine Fast Yellow NN. It dyes a bright, greenish yellow of exceptional fastness to chlorine light and washing. It is readily soluble, is very level dyeing and exhausts easily.

Market Conditions

Weighted Index Number for Chemicals and Allied Products Advances

Strength in Allied Products Continues to Influence Price Averages—Consuming Demand Still Holds to Small Lots

ACCORDING to the weighted index number the average price level for chemicals and allied products is tending toward higher levels. Firmness in metal salts and miscellaneous chemicals has a bearing on the weighted index but the upward swing is largely due to rises in basic vegetable oils. However, it is regarded as significant that values are beginning to move in the opposite direction and price recoveries throughout the list are regarded as more probable than a movement toward lower levels.

Buying orders are not gaining in volume to any appreciable extent but inquiry has been more encouraging. Large lot business is not prominent and possibly will not assert itself for another month yet there is evidence of a gradual improvement in market conditions. Withdrawals against old contracts are more regular following the opening of some textile and paper plants which had been closed. Other consuming trades also are operating more extensively and the volume of resale offerings has been reduced.

Official figures have just been received, showing exports of chemical products during June. The totals are interesting inasmuch as they show a material decline in shipments to foreign countries and demonstrate the extent to which loss of export business has contributed to the slowness of our markets. A similar result is found in the import figures in June as arrivals of foreign-made chemicals were considerably below those for the preceding month.

Advices from Washington last week called attention to the fact that in September, the import duty on coal-tar dyes will be reduced. The present duty was made effective for a period of 2 years with the idea of giving the home industry an opportunity under high tariff protection, to establish itself firmly. Considerable speculation has arisen regarding the probable effect of the lower duty which soon will become operative.

Acids

The heavy acid group has maintained a quiet position with buyers favored on transactions. Some producers of sulphuric acid are sold ahead for the balance of the year and are not interested in the present market. This condition is far from general as many producers are carrying large stocks and the market has suffered because supply has overbalanced demand. The supply of muriatic acid also is large and holders have shown a willingness to grant concessions whenever business was in sight. Nitric acid has shown a price range according to seller with a more general attempt to establish a steady trading basis. Acetic acid is holding fairly steady with production costs unchanged. Citric acid has sold in a fairly large and total consumption this season has been close to normal according to views of some sellers. Imports of oxalic acid in June were 180,118 lb. which represents a gain over June of last year. Imported citric has found plenty of competition from domestic makers in recent weeks and the latter are still prominent in the market. Tartaric acid has failed to move up to the standard of last year and the loss in trade has fell more heavily on the domestic product. Fair interest is reported for imported formic acid but sellers of domestic are not finding a ready market because of the premium asked for the latter.

Carbon Tetrachloride Marked Down in Price—Bichromates Hold Easy Position—Yellow Prussiate of Potash More Free—Copper Sulphate Firmer—Export Inquiry for Caustic Soda—Tin Oxide Advances—Nitrite of Soda Steady—Firm Market for Benzene—Stocks of Phosphorus Limited

Potashes

Bichromate of Potash—Exports of bichromate of potash in June were 73,507 lb. as compared with 127,493 lb. in June last year. While the export outlet is not large, there has been an appreciable falling off in shipments abroad this year and this has aided in slowing up the market. In the past week there were offerings for export at 8¾c. per lb. The lowest price heard for domestic buyers was 9c. per lb. and there was a range upward depending on seller and quantity.

Carbonate of Potash — Buying has been slow and holders have been forced to meet buyers' views in order to move stocks. Very little change is reported at primary points and domestic markets are influenced at present, largely by supply and demand with the greater initiative taken by sellers. Asking prices are on a basis of 5¾@6c. per lb. for hydrated 80-85 per cent, 5¼@5½c. per lb. for calcined 80-85 per cent, and 5¾@6c. per lb. for 96-98 per cent. Imports in June were 571,944 lb. as against 664,874 lb. in June, last year.

Caustic Potash—The slower buying movement which has been in evidence in the past few months is borne out by receipt of official import figures which show that arrivals from abroad in June were 870,880 lb. as compared with 1,121,677 lb. in June, last year. Imports, however, are still relatively large as referred to consuming requirements and show the preference which is given to the imported material. Prices have not changed during the week and spot goods are offered at 6½@6¾c. per lb. according to seller. Shipments are quoted at 6½c. per lb.

Permanganate of Potash — There were firm bids in the market for spot permanganate at 13½c. per lb. but holders of stocks were not willing to sell at that figure. It was intimated that 13¾c. per lb. could be done but the general asking price was 14c. per lb.

Prussiate of Potash—While prices for yellow prussiate of potash showed a range according to seller and 18½c. per lb. was an inside figure in some quarters for spot goods, it was possible to buy at 18c. per lb. On forward deliveries imported prussiate was quoted at 17½@17¾c. per lb.

Sodas

Bichromate of Soda — Sellers have been more eager to unload stocks and irregularity of prices has featured the market. Rumors have been heard to the effect that sales were made to domestic buyers at 6¾c. per lb. The open quotations are 7c. to 7½c. per lb., according to seller. Export buyers have been able to secure quotations at 6¾c. per lb.

Caustic Soda—Export inquiry was again prominent and sales were reported at prices ranging from 2.80c. to 2.90c. per lb. Sales were made to domestic consumers at 2.90c. per lb. Exports of caustic in June were 6,321,297 lb. This shows a decline of more than one-third from the total exported in June, last year but shows a slight gain over the outward shipments in May. Domestic consumers are interested in the contract prices which will be named for next year with no intimation from producers relative to probable changes. Until recently sentiment inclined toward belief in a lower price schedule for next season but doubt is now expressed, in some quarters, that any reduction will be made

from the present contract price of 3.10c. per lb.

Nitrite of Soda—Imports of nitrite of soda in June were heavy, amounting to 1,020,492 lb. as compared with 169,850 lb. in June, last year. A good part of arrivals passed direct to consumers and there is no apparent surplus of supplies in the spot market. Prices are holding steady with German nitrite quoted at 8¾c. per lb., Norwegian at 9c. per lb., and domestitc at 9c. per lb., at works.

Prussiate of Soda—Moderate sized lots are in demand but no large business was noted. The spot market is being maintained at 9½c. per lb., as an inside price. Shipments from foreign markets are offered at 9¼c. per lb. but are not attracting much buying. Imports in June amounted to 180,659 lb. as compared with 69,453 lb. in June, last year.

Miscellaneous Chemicals

Acetate of Lime—Exports of acetate of lime in June compared favorably with those for the corresponding period of last year, the figures being 3,183,889 lb. and 3,018,617 lb. respectively. Demand from domestic consumers has not been active but prominent sellers report business as about normal for this time of year. Quotations are holding at $3 per 100 lb.

Arsenic — Domestic producers continue to report a fair call for arsenic. Importers find an inactive market but it is noted that asking prices are being maintained and in spite of requests for deferring of deliveries and lack of new buying, there is an absence of selling pressure and a growing conviction that the lowest price levels have been reached. Domestic arsenic for prompt and forward deliveries is quoted at 7⅞c. per lb., for round lots. Japanese is held at 7⅞c. per lb., in the spot market and European at 8c. per lb. Imports are holding up well and in June arrivals were 2,072,315 lb., which compares with 2,365,475 lb. in June, last year.

Bleaching Powder — As the season advances with practically no reports of price cutting, consumers are less confident of a break in the market and some discussion has arisen regarding contract prices for the coming season. It is thought in some quarters that the holding of prices during the hot weather period is indicative of a continuance of the contract price. The market is not active at present but this is a seasonal condition and apparently is to have no effect on values. Current quotations are $1.90 per 100 lb. for bleach in drums, carlots, at works. Liquid chlorine is steadily held at the contract price of $4.50 per 100 lb., in tanks, at works. Export demand for bleach has been good and foreign shipments in June reached a total of 2,479,209 lb. which is within 5,000 lb. of the total shipped in June, last year.

Copper Sulphate—The metal market has been advancing in price and this factor combined with the presence of buying orders, brought an uplift to prices for the chemical. Some domestic producers are quoting 4½c. per lb., with others willing to take business at 4.35c. per lb. Imported sulphate is quiet with shipments attracting no attention at 4.20c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	163.95
Last week	161.00
Aug., 1923	168.00
Aug., 1922	152.00
Aug., 1921	158.00
Aug., 1920	264.00
Aug., 1919	251.00
Aug., 1918	278.00

Continued strength in vegetable oils, together with a higher market for some of the metal salts, caused the advance of 295 points in the weighted index number.

Calcium Arsenate—Reports of a good consumption of arsenate come from southern points but demand has failed to come up to expectations and has not been evenly distributed among manufacturers. Selling prices are too low to admit of profitable business based on the price at which arsenic was bought by the majority of arsenate producers. It is evident that the carryover will be much larger than it was last year. The sales price, however, has been established around the 9c. per lb. level, at works, and it is improbable that any recovery will be made.

Tin Oxide—All the tin salts have been strengthened by the higher market established for the metal and sellers of tin oxide have marked quotations up to 52c. per lb.

Alcohol

A firmer undertone featured the market for denatured alcohol, but producers did not change the selling basis. The upward trend to prices for raw materials has steadied the general situation. Business was described as fair. Special denatured, formula No. 1, was offered at 43@43½c. per gal., in drums, carload lots.

Methanol was quiet, but production has been restricted and this accounts for the better undertone. The quotations were unchanged, pure holding at 75c. per gal., tank car shipments from works.

Butanol is moving in a larger way against existing contracts. Nominally the market held at 25@30c. per lb.

Coal-Tar Products

Better Demand for Pure Benzene—Imports of Crude Naphthalene Smaller—Phenol Offered More Freely for Immediate Delivery

THERE was a better call for pure benzene and, with offerings comparatively small, because of the restricted output, a firmer undertone was in evidence in all quarters. First hands reported that the production of light oils was smaller than in the preceding week. According to official information the production of byproduct coke for the month of June amounted to 2,403,000 tons, which compares with 3,166,000 tons for the month of June a year ago. The offerings of phenol have increased, several producers being anxious to quote on forward business. There was little if any change in the naphthalene situation. The fact that imports have fallen off attracted some attention. The arrivals of crude naphthalene in June, according to official figures, amounted to 112,000 lb., which compares with 1,730,436 lb. in June a year ago. Advices from England again reported lower prices for creosote oil. Trading in most of the intermediates was dull and prices named covered a wide range.

Aniline Oil and Salt—Leading makers continued to quote the market for oil on the basis of 16c. per lb., carload lots, drums extra, f.o.b. point of production. Trading was along routine lines only. Aniline oil for red was nominal at 40c. per lb. Aniline salt was barely steady at 22@23c. per lb. Export demand was dull.

Benzene—Demand for pure benzene was good and with little to be had the situation was firm all week. Producers reported sales on the basis of 25c. per gal., tank cars, f.o.b. works, nearby delivery. On the 90 per cent grade 23c. per gal. was demanded on tank car business, nearby delivery. The motor fuel grade is moving freely against contracts placed some time ago, prices paid being based on the current market for gasoline. Exports of benzene in June amounted to 4,182,586 lb., which compares with 14,261,277 lb. in June a year ago.

Creosote—Advices from abroad report continued unsettlement in the market, attributed largely to lack of buying interest on the part of American consumers. Manchester reported offerings at 6d. per gal., with a possibility of doing business at concessions. The quotation is based on bulk shipments, nearby positions. Imports in June were 13,409,513 gal., against 6,111,353 gal. in June 1923.

Cresylic Acid—Trading was moderate in volume and prices were irregular, depending upon the quantity and seller. On the 97 per cent grade prices ranged from 63@68c. per gal. Foreign markets were quotably unchanged.

Naphthalene—Offerings were plentiful and prices easy. White flake on spot settled nominally at 4¾@5c. per lb., but, in certain instances, the inside figure might be shaded. On chips the market held around 4¼@4½c. per lb., carload basis. Crude, to import, was unchanged around 2c. per lb. for 75@78 per cent material. Imports of crude naphthalene for the 12 months ended June 30, according to the Department of Commerce, amounted to 14,064,587 lb., which compares with 13,053,047 lb. for the corresponding period a year ago.

Phenol—No additional price changes took place in the past week, producers maintaining quotations on U.S.P. phenol for immediate delivery at 24@26c. per lb., the price depending upon the quantity.

Vegetable Oils and Fats

Strength in Lard and Cotton Dominates Market for Edible Oils—Linseed Quiet, But Firm—Tallow Higher

WITH hardly a setback in the upward movement of prices for grains, lard and cotton, sentiment in the market for vegetable oils, especially the edible group, continued bullish. New high record prices for the season obtained for crude and refined cottonseed oil, corn oil and imported sesame oil. Stocks of old crop cottonseed oil are smaller than a year ago and traders look for an extremely tight market before new crop oil becomes available. Buyers did not follow up the recent advance in linseed oil to any extent, yet prices were well maintained on the strength in flaxseed and prospects for small supplies of seed until October. Higher prices prevailed for coconut, palm and rapeseed oils. Crude menhaden oil was advanced on reports of poor fishing along the Atlantic coast. Soap makers were in the market for round lots of tallow; melters asked higher prices.

Cottonseed Oil—Higher prices did not check business sufficiently to bring about any change in sentiment. Speculative activity ran high, under the influence of continued strength in corn, hogs, lard and cotton. Traders generally take the stand that the shortage in this season's corn crop will mean a generally higher trading level for all animal fats and edible oils. With prospects for a large crop of cotton no longer so favorable the outlook for pressure in the new crop positions seems remote. In fact new crop crude cottonseed oil, early September delivery, sold at 10½c. per lb., f.o.b. mills, while on late September delivery 10c. was bid and turned down. Crude oil for immediate delivery sold at prices ranging from 11½@12¼c. per lb., tank cars, Southern points, with offerings scanty. Prime summer yellow, in bbl., sold at 15.15c. per lb., Eastport, Me., August delivery. Bleachable oil, loose, sold at 13¾c. per lb., Chicago. August prime summer yellow oil, on the Produce Exchange, on Thursday, closed at 13½c. bid and 14c. asked. October prime summer yellow settled at 12.12c. bid and 12.14c. asked, with November at 11.26c. bid and 11.29c. asked. Lard compound was advanced in the New York market to 15¼@15½c. per lb., carload basis. Pure lard, in Chicago, cash, in tierces, settled nominally at 13.42c. per lb.

Linseed Oil—There was a fair inquiry for nearby oil, but buyers' views were a shade under the market and not a great deal of business was reported. The flaxseed markets were higher, supporting prices for oil in all positions. Most crushers held out for $1 per gal. for spot oil, in cooperage, carload lots. The offerings were small, even for August-September delivery, and bids at 98c. per gal. found few sellers. October delivery settled nominally at 96c., with November forward at 92c. per gal. No important change took place in the flaxseed situation. The crop reports from the Northwest were mixed, but in the main good. The official estimate on the Canadian crop places the area sown to flaxseed at 764,500 acres, which compares with 629,938 acres in 1923. Owing to the fact that the condition is not so good as a year ago traders expect a smaller yield. In the Argentine old crop seed is firmly held and the September option, at Buenos Aires, settled at $2.05½ per bu., which compares with $1.98 a week ago. Regarding the new Argentine crop situation reports are conflicting, with some traders predicting a smaller acreage than last season. Duluth quoted July flaxseed on Thursday at $2.56 per bu., which compares with $2.52½ a week ago. September seed was nominal at $2.39½ and October at $2.34 per bu. Linseed cake for export was in good demand and firm at $44@$45 per ton, f.a.s. New York.

Argentine Flaxseed Exports to United States Smaller

Shipments of flaxseed from the Argentine continue heavy, with Europe the largest buyer. On good prospects for a larger yield in the United States for this season, crushers here have been less active in the South American markets.

Argentine shipments of flaxseed, by countries, from Jan. 1 to July 25, with a comparison, follow:

	1924 Bushels	1923 Bushels
United Kingdom....	5,172,000	2,344,000
Continent..........	16,602,000	10,700,000
United States.......	13,026,000	18,984,000
On orders..........	7,214,000	5,060,000
Total............	42,014,000	37,088,000

China Wood Oil—There was a steady market, but business was slow. Pacific coast sellers held out for 14c. per lb. for oil in cooperage, prompt shipment. On tank car business 13½c. was the nominal price, f.o.b. coast. In New York spot oil held at 15@15½c. per lb., in cooperage.

Coconut Oil—Trading was inactive, yet prices ruled firm, closing ⅛c. higher both here and on the coast. Sellers advanced their ideas on higher prices for copra. Ceylon type oil for August-September shipment from the Pacific coast closed at 8⅝c. per lb., tank car basis, with October forward nominal at 8½c. In New York 9½c. per lb. was asked for August shipment oil, in sellers' tank cars.

Corn Oil—Crude corn oil advanced on the strength in cottonseed oil. Early in the week sales took place at 11¼c. per lb., tank cars, f.o.b. point of production. Later, however, 11½c. was bid, f.o.b. Chicago.

Palm Oils—Small lots of Lagos oil sold on spot at 8¼c. per lb. The market for futures was raised to 8.05c. per lb., with the undertone strong. Niger oil on spot closed at 8c. per lb., with August-October shipment from Africa at 7¾c. per lb.

Rapeseed Oil—Market higher, spot selling at 86c. per gal. and afloat at 85c. per gal.; futures nominal at 84c. per gal.

Sesame Oil — Demand active, but business restricted by paucity in offerings from abroad. Continental buyers have absorbed most of the production. Refined oil afloat sold at 12⅝c., and later 13c. was asked. September shipment from Hull offered at 12½c., with October-November at 12@12¼c. per lb. c.i.f. New York.

Fish Oils — Fishing for menhaden poor and, with better demand for crude oil, the market was raised to 45c. per gal. f.o.b. point of production. Sales took place at 45c., tank cars, Baltimore. Newfoundland cod oil offered freely for shipment at 57½c. per gal.

Tallow, Etc.—There were buyers of extra special tallow at 8½c. per lb., with holders asking 8¾c. at the close. Yellow grease advanced to 7⅜@7⅝c. per lb. Oleo stearine sold at 14½c. per lb., an advance of ½c. Red oil raised to 9c.

Miscellaneous Materials

Antimony—There was a better demand and holders advanced the market for Chinese ½c. per lb., the revised quotation being 8¾c. Cookson's "C" grade nominal at 11½@11¾c. per lb. Chinese needle, lump, 8½@9c. per lb.

Barytes—Demand fair for this season of the year and producers report a steady market. White floated held at $23 per ton, carload lots, packages included, f.o.b. St. Louis. Crude was unchanged at $8@$9 per ton, bulk, f.o.b. mines.

Glycerine—The market was firm on strength in raw materials and fair buying interest. Crude sold at a slight advance in price, soap lye, basis 80 per cent, moving at 11c. per lb., loose, f.o.b. Middle West. Dynamite firm at 16½c. per lb., in drums, carload lots. Chemically pure was raised to 17½c. per lb., in drums, New York, by some traders, but others continued to quote 17c. per lb.

Naval Stores—Spirits of turpentine was advanced to 84c. per gal. on higher primary markets. Rosins in good demand and firm, the lower grades holding at $5.60@$5.70 per bbl.

White Lead—Corroders report a good demand for this pigment and state that supplies are none too large. The metal has shown a strengthening tendency and pig lead was advanced to 7½c. per lb. No change was made in the sales prices for the pigments but the undertone is firmer. Standard dry white lead, basic carbonate, is offered at 9¾c. per lb., in casks or bbl., carlots. Some makes are offered at concessions from the above price.

Zinc Oxide—The metal is steady but has not changed enough to bring about any revision in the oxide market. Withdrawals against contracts are reported to be going forward regularly and large consumers are covered ahead. American process, lead free, is offered at 7⅝c. per lb., in bags, carload lots.

Imports at the Port of New York

July 25 to July 31

ACIDS—Citric—100 bbl., Messina, Order; 26 csk., Palermo, Order. **Oxalic**—10 bbl., Hamburg, Order. **Tartaric**—860 csk., Palermo, W. Neuberg; 724 csk., Palermo, Order.

ACETONE OIL—77 dr., Hamburg, R. W. Greeff & Co.

AMMONIUM CARBONATE — 10 bbl., Liverpool, Order.

AMMONIUM NITRATE—375 csk., Hamburg, Kuttroff, Pickhardt & Co.

ANTIMONY REGULUS—500 cs., Hankow, International Banking Corp.; 500 cs., Shangsha, W. R. Grace & Co.

ANTIMONY SULPHIDE—7 csk., London, L. H. Butcher & Co.; 17 csk., Newcastle, E. Hills' Son & Co.

ARSENIC—500 csk., Hamburg, Central Union Trust Co.; 2,360 pkg., Kobe (at San Francisco), Order; 1,500 pkg., Kobe (at San Francisco), Order.

BARIUM CARBONATE—200 bg., Hamburg, Roessler & Hasslacher Chem. Co.

BARIUM CHLORIDE—152 csk., Hamburg, W. Schall & Co.; 78 bbl., Hamburg, Order.

BARYTES—100 bg. and 41 csk., Hamburg, A. Klipstein & Co.; 60 csk., Rotterdam, Schall Color & Chem. Co.; 25 csk., Hamburg, A. Hurst & Co.

CALCIUM CITRATE—36 csk., Messina, Order.

CALCIUM METAL — 2 cs., Havre, C. Hardy, Inc.

CAMPHOR—23 cs., Hamburg, Order.

CARBON BISULPHIDE—4 kegs, Hamburg, Rohner, Gehrig & Co.

CHALK—1,550 bg. and 100 bbl., Antwerp, National City Bank; 500,000 kilos, Dunkirk, American Exchange National Bank; 546,444 kilos, Dunkirk, Taintor Trading Co.; 800,000 kilos, Dunkirk, J. W. Higman Co.; 500 tons, London, Baring Bros. & Co.

CHEMICALS—44 pkg., Hamburg, Roessler & Hasslacher Chem. Co.; 15 csk., Hamburg, A. Klipstein & Co.; 10 cs., Hamburg, Eimer & Amend; 187 pkg., Hamburg, Pfaltz & Bauer; 47 cs., Hamburg, Tice & Lynch; 77 bbl., Havre, C. Hardy, Inc.; 58 pkg., Rotterdam, H. A. Metz & Co.; 50 pkg., Rotterdam, Kuttroff, Pickhardt & Co.; 280 bg., Glasgow, Coal & Iron National Bank; 20 cs., Hamburg, Order; 180 csk., Hamburg, Jungmann & Co.

CHINA CLAY—838 tons, Fowey, J. W. Higman Co.; 100 tons, Fowey, Morey & Co.; 20 tons, Fowey, L. A. Salomon & Bros.; 1,319 tons, Fowey, Baring Bros. & Co.

COLORS — 14 csk. aniline, Antwerp, Geigy Co.; 23 csk. do., Antwerp, American Exchange National Bank; 1 csk. do., Antwerp, American Express Co.; 50 cs., Antwerp, Fearon, Child & Co.; 5 cs. aniline, Havre, Standard Products Corp.; 5 csk. aniline, Rotterdam, Grasselli Chem. Corp.; 5 pkg. do., Rotterdam, H. A. Metz & Co.; 4 csk. earth, Rotterdam, Stanley Doggett, Inc.; 162 csk. do., Rotterdam, A. Hurst & Co.; 4 pkg. aniline, Havre, Sandoz Chemical Works; 4 csk. do., Havre, Carbic Color & Chem. Co.; 2 cs aniline, Genoa, Order; 75 cs., Bremen, Heller & Merz; 4 dr., Bremen, H. Heinrich.

CREOSOTE — 50 demijohns, Hamburg, Merck & Co.

DIVI DIVI — 1,034 bg., Maracaibo, Suzarte & Whitney; 283 bg., Porto Colombia, Ultramares Corp.

DYE EXTRACT—10 csk., Havre, Morris Export Co.

EPSOM SALT—850 bg., Hamburg, Order; 1,000 bg., Bremen, Bank of America.

FERROCOBALT — 2 cs., Liverpool, De Courcey, Browne, Inc.

FULLERS EARTH—350 bg., London, L. A. Salomon & Bros.

GALLNUTS—400 cs., Hankow, Mallinckrodt Chemical Works.

GAMBIER—143 bg. cube, Singapore, Order.

GUMS—850 bg. arabic, Port Sudan, Order; 70 bg. copal, Singapore, Baring Bros. & Co.; 200 cs. and 210 bg. damar, Singapore, L. C. Gillespie & Son; 350 bg. and 150 cs. damar, Singapore, Order; 337 bg. karaya, Bombay, Order; 100 bg. copal, Singapore, Order.

IRON CHLORIDE—24 csk., Rotterdam, Farmers Loan & Trust Co.

IRON OXIDE—20 csk., Liverpool, Stanley Doggett, Inc.; 8 cs., Liverpool, Order; 20 csk., Hull, J. Lee Smith & Co.

LOGWOOD EXTRACT—386 bbl., Cape Haitian, Logwood Mfg. Co

LITHOPONE — 100 csk., Rotterdam, Brown & Roese; 40 csk., Rotterdam, L. H. Butcher & Co.

MAGNESITE — 105 bbl. and 250 bg., Rotterdam, Innis, Speiden & Co.

MAGNESIUM CHLORIDE — 548 dr., Hamburg, Innis, Speiden & Co.; 547 dr., Hamburg, Innis, Speiden & Co.

MANGROVE BARK — 500 bg. extract, Singapore, Order; 500 bg., Singapore, Order.

MYROBALANS — 1,818 pkt., Calcutta, Order; 12,823 bg., Bombay, Order.

NAPHTHALENE — 200 bg., Hamburg, Order.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

FERTILIZERS, natural, mineral, or chemical. Swatow, China. Exclusive agency.—11,107.

TITANIUM OXIDE, pulverized. Havre, France. Agency.—11,104.

PAINTS, solvents, and glue. Malines, Belgium. Agency.—11,103.

POTASSIUM BICHROMATE and sodium bichromate. Brussels, Belgium. Agency.—11,105.

ROSIN and carnauba wax. Hamburg, Germany. Purchase.—11,106.

ROSIN and turpentine. Hamburg, Germany. Purchase and agency.—11,102.

SUPERPHOSPHATE. Cape Town, South Africa. Agency.—11,108.

TALLOW, for soap manufacture. Marseille, France. Agency.—11,056.

OCHER—341 csk., Marseilles, Reichard-Coulston, Inc.; 100 csk., Marseilles, J. Lee Smith & Co.; 150 csk., Marseilles, Order.

OILS—China Wood—279 csk., Hamburg, Brown Bros. & Co.; 308 csk., Hankow, Standard Bank of South Africa; 650 bbl., Hankow, Order. **Cod**—67 csk., St. Johns, National Oil Products Co.; 12 csk., St. Johns, Meade, Johnston & Co.; 60 csk., St. John, R. Badcock & Co. **Coconut**—10 dr., Colombo, Order; 856 tons (in bulk), Manila, Philippine Refining Co. **Castor**—99 bbl., Hull, Bankers Trust Co. **Linseed**—180 bbl., Rotterdam, Smith-Wiemann Oil Co. **Palm**—858 csk., Antwerp, Order; 479 csk., Hamburg, African & Eastern Trading Co. **Palm Kernel**—100 bbl., Hull, Order. **Rapeseed**—833 tons crude extracted, London, Vacuum Oil Co.; 50 bbl., Rotterdam, Lockwood & Co.; 520 bbl., Hull, J. Q. Francesconi & Co.; 523 bbl., Hull, Order. **Sesame**—86 bbl., Rotterdam, J. P. Grant & Co.; 155 bbl., Hull, Order.

OIL SEEDS—Castor—1,680 bg., Calcutta, American Trading Co.; 730 bg., Cape Haitian, Order; 262 bg., Port de Paix, Order; 4,781 bg., Bombay, Volkart Bros.; 9,330 bg., Bombay, Order; 6,830 bg. Cocanada Volkart Bros.; 10,712 bg., Cocanada, Order. **Linseed** — 55,558 bg., Rosario, Spencer, Kellogg & Sons; 18,855 bg., Buenos Aires, Spencer, Kellogg & Sons.

PITCH — 171 bbl. stearine, Hamburg, American Exchange National Bank; 18 csk., Hamburg, Order.

POTASSIUM SALTS — 10 bbl. persulphate, Hamburg, Roessler & Hasslacher Chem. Co.; 235 dr. caustic, Hamburg, A. Klipstein & Co.; 8 csk. carbonate, Hamburg, Irving Bank-Col. Trust Co.; 20 cs. bromide, Hamburg, Order; 2,000 bg. sulphate, 6,000 bg. muriate and a quantity of manure salt, Antwerp Societe des Potasses d'Alsace; 200 cylinders chlorate, Havre, C. Hardy, Inc.; 25 csk. carbonate, Bremen, P. H. Petry & Co.; 2,000 bbl. chlorate, Hamburg, Seaboard National Bank; 27 bbl. alum, Hamburg, Order.

PLUMBAGO—200 bbl., Colombo, Paterson, Boardman & Knapp; 100 bbl., Colombo, N. Y. Trust Co.; 410 bbl., Colombo, Irving Bank-Col. Trust Co.; 140 bbl., Colombo, Order.

PYRIDINE — 4 dr., Hamburg, R. W. Greeff & Co.

PUMICE—1,056 bg., Canneto Lipari, National City Bank; 4,510 bg., Canneto Lipari, R. J. Waddell & Co.; 575 pkg., Canneto Lipari, Order.

SAL AMMONIAC — 46 bbl., Hamburg, Order.

SHELLAC — 600 bg., Calcutta, H. W. Peabody & Co.; 1,300 bg., Calcutta, Brunswick, Balke, Collender Co.; 210 bg., Calcutta, Marx & Rawolle; 1,457 bg. and 50 cs., Calcutta, Order; 300 bg., Calcutta, Maclac Co.; 250 bg., Calcutta, Standard Bank of South Africa; 1,415 bg., Calcutta, Order; 300 bg., Calcutta, Brunswick, Balke, Collender Co.; 168 cs., Singapore, Order.

SODIUM SALTS—20 csk. bromide, Hamburg, Bank of the Manhattan Co.; 259 dr. sulphide, Hamburg, C. S. Grant & Co.; 625 cs. cyanide, Hamburg, Roessler & Hasslacher Chem. Co.; 364 csk. hyposulphite, Marseilles, E. M. Sergeant & Co.; 60 csk. hydrosulphite, Antwerp, E. Ritter; 11,025 bg. nitrate, Antofagasta, Antony, Gibbs & Co.; 7,447 bg. do., Iquique, E. I. du Pont de Nemours & Co.; 17,742 bg. do., Iquique, Wessel, Duval & Co.; 10,899 bg. do., Iquique, Antony Gibbs & Co.; 14 csk. prussiate, Rotterdam, Order; 230 cs. cyanide, Liverpool, Panama Pacific Line; 60 cs. cyanide, Liverpool, Order; 36,141 bg. nitrate, Iquique, Wessel, Duval & Co.; 17,000 bg. do. (discharged at Jacksonville), Iquique, Wessel, Duval & Co.; 13,797 bg. nitrate, Iquique, W. R. Grace & Co.; 100 csk. hyposulphite, Hamburg, C. Hardy, Inc.; 8 cs. bromide, Hamburg, Order.

SILVER SULPHIDE — 90 bg. Antofagasta, Watson, Geach & Co.

TARTAR — 100 bg., Marseilles, Royal Baking Powder Co.; 100 bg., Marseilles, C. Pfizer & Co.

TITANIUM OXALATE — 5 csk., Hamburg, A. Klipstein & Co.

TURMERIC—505 bg., Cocanada, American Exchange National Bank.

TURPENTINE SUBSTITUTE — 25 dr., Hamburg, Order.

VANADIUM ORE — 774 bg., Bremen, Watson, Geach & Co.; 3,585 bg., Callao, Vanadium Corp. of Am.

WAXES — 750 bg. montan, Hamburg, Strohmeyer & Arpe; 22 bg. beeswax, Valparaiso, L. Montano; 34 bg. do., Valparaiso, Banco Aleman; 102 cs. beeswax, Havre, Smith & Nichols; 93 bg. carnauba, Para, Strohmeyer & Arpe; 79 bg. do., Para, N. Y. Trust Co.; 120 bg. do., Para, J. H. Rossbach & Bros.; 354 bg. do., Para, Nat'l City Bank; 218 bg. do., Para, Elbert & Co.; 246 bg. do., Para, Order; 50 cs. spermacetti, Glasgow, Order; 800 bg. Paraffine, London, Order; 25 bg. beeswax, Valparaiso, Guaranty Trust Co.; 13 bg. beeswax, Santiago, Royal Bank of Canada; 14 bbl. do., Cienfuegos, Order.

WHITING—1,000 bg., Antwerp, Bankers Trust Co.; 1,950 bg., Dunkirk, Taintor Trading Co.

WITHERITE — 200 tons, Newcastle, Order.

WOOL GREASE — 12 bbl., Liverpool, Order; 100 bbl., Bremen, Order; 20 bbl., Bremen, Order.

ZINC WHITE — 10 csk., Hamburg, A. Klipstein & Co.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetone, drums, wks.	lb.	$0.15 -	$0.15½
Acetic anhydride, 85%, dr.	lb.	.34 -	.36
Acid, acetic, 28%, bbl.	100 lb.	3.12 -	3.37
Acetic, 56%, bbl.	100 lb.	5.85 -	6.10
Acetic, 80%, bbl.	100 lb.	8.19 -	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 -	11.51
Boric, bbl.	lb.	.09 -	.09½
Citric, kegs	lb.	.46 -	.46½
Formic, 85%	lb.	.12½-	.13
Gallic, tech.	lb.	.45 -	.50
Hydrofluoric, 52%, carboys	lb.	.11 -	.12
Lactic, 44%, tech., light, bbl.	lb.	.12½-	.13
22% tech., light, bbl.	lb.	.06 -	.06½
Muriatic, 18° tanks	100 lb.	.80 -	.85
Muriatic, 20°, tanks	100 lb.	.95 -	1.00
Nitric, 36°, carboys	lb.	.04 -	.04½
Nitric, 42°, carboys	lb.	.04½-	.05½
Oleum, 20%, tanks	ton	16.00 -	17.00
Oxalic, crystals, bbl.	lb.	.09½-	.10
Phosphoric, 50% carboys	lb.	.07 -	.08
Pyrogallic, resublimed	lb.	1.55 -	1.60
Sulphuric, 60°, tanks	ton	8.00 -	9.00
Sulphuric, 60°, drums	ton	12.00 -	13.00
Sulphuric, 66°, tanks	ton	13.00 -	14.00
Sulphuric, 66° drums	ton	17.00 -	18.00
Tannic, U.S.P., bbl.	lb.	.65 -	.70
Tannic, tech., bbl.	lb.	.45 -	.50
Tartaric, imp., powd., bbl.	lb.	.27 -	.28
Tartaric, domestic, bbl.	lb.	.30 -	....
Tungstic, per lb.	lb.	1.20 -	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.25 -	.30
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.83 -	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.81 -	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.49 -	...
No. 1, 190 proof, special, dr.	gal.	.43 -	...
No. 1, 188 proof, bbl.	gal.	.52 -	...
No. 1, 188 proof, dr.	gal.	.46 -	...
No. 5, 188 proof, bbl.	gal.	.48 -	...
No. 5, 188 proof, dr.	gal.	.42 -	...
Alum, ammonia, lump, bbl.	lb.	.03½-	.04
Potash, lump, bbl.	lb.	.02¾-	.03½
Chrome, lump, potash, bbl.	lb.	.05½-	.06
Aluminum sulphate, com., bags	100 lb.	1.35 -	1.40
Iron free bags	lb.	2.35 -	2.45
Aqua ammonia, 26°, drums	lb.	.06½-	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 -	.30
Ammonium carbonate, powd. tech., casks	lb.	.12 -	.13
Ammonium nitrate, tech., casks	lb.	.09 -	.10
Amyl acetate tech., drums	gal.	2.50 -	2.60
Antimony oxide, white, bbl.	lb.	.09½-	.10
Arsenic, white, powd., bbl.	lb.	.07½-	.08
Arsenic, red, powd., kegs	lb.	.14½-	.15½
Barium carbonate, bbl.	ton	60.00 -	61.00
Barium chloride, bbl.	ton	78.00 -	79.00
Barium dioxide, 88%, drums	lb.	.17½-	.18
Barium nitrate, casks	...	.08½-	.08½
Blanc fixe, dry, bbl.	lb.	.03½-	.04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 -	....
Spot N. Y. drums	100 lb.	2.20 -	2.25
Borax, bbl.	lb.	.05 -	.05½
Bromine, cases	lb.	.34 -	.38
Calcium acetate, bags	100 lb.	3.00 -	3.05
Calcium arsenate, dr.	lb.	.09 -	.09½
Calcium carbide, drums	lb.	.05 -	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 -	....
Gran. drums works	ton	27.00 -	....
Calcium phosphate, mono, bbl.	lb.	.06½-	.07½
Camphor, Jap. cases	lb.	.71 -	.72
Carbon bisulphide, drums	lb.	.06 -	.06½
Carbon tetrachloride, drums	lb.	.07 -	.07½
Chalk, precip.—domestic, light, bbl.	lb.	.04½-	.04½
Domestic, heavy, bbl.	lb.	.03½-	.04
Imported, light, bbl.	lb.	.04½-	.05
Chlorine, liquid, tanks, wks.	lb.	.04½-	....
Contract, tanks, wks.	lb.	.04½-	....
Cylinders, 100 lb., wks.	lb.	.05½-	.07½
Chloroform, tech., drums	lb.	.30 -	.32
Cobalt, oxide, bbl.	lb.	2.10 -	2.25
Copperas, bulk, f.o.b. wks.	ton	15.00 -	16.00
Copper carbonate, bbl.	lb.	.17 -	.17½
Copper cyanide, drums	lb.	.45 -	.46
Copper oxide, kegs	lb.	.16 -	.16½
Coppersulphate, dom., bbl.	100 lb.	4.50 -	4.60
Imp bbl.	100 lb.	4.12½-	4.20
Cream of tartar, bbl.	lb.	.20½-	.21
Epsom salt, dom., tech., bbl.	100 lb.	1.75 -	2.00
Epsom salt, imp., tech., bags	100 lb.	1.35 -	1.40
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.10 -	2.35
Ether, U.S.P., dr concent'd.	lb.	.13 -	.14
Ethyl acetate, 85%, drums.	gal.	.92 -	.95

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Ethyl acetate, 99%, dr.	gal.	$1.08 -	$1.10
Formaldehyde, 40%, bbl.	lb.	.09 -	.09½
Fullers earth—f.o.b. mines.	ton	7.50 -	18.00
Furfural, works, bbl.	lb.	.25 -	....
Fusel oil, ref., drums	gal.	2.75 -	3.50
Fusel oil, crude, drums	gal.	1.50 -	1.75
Glaubers salt, wks., bags	100 lb.	1.20 -	1.40
Glaubers salt, imp., bags	100 lb.	.90 -	.92
Glycerine, c.p., drums extra	lb.	.17 -	.17½
Glycerine, dynamite, drums	lb.	.16½-	....
Glycerine, crude 80%, loose	lb.	.11 -	.11½
Hexamethylene, drums	lb.	.65 -	.70
Lead:			
White, basic carbonate, dry, casks	lb.	.09¼-	....
White, basic sulphate, casks	lb.	.09¼-	....
White, in oil, kegs	lb.	.11¾-	.12½
Red, dry, casks	lb.	.10¾-	....
Red, in oil, kegs	lb.	.12¾-	.13½
Lead acetate, white crys., bbl.	lb.	.14½-	....
Brown, broken, casks	lb.	.13½-	....
Lead arsenate, powd., bbl.	lb.	.16 -	.18
Lime-Hydrated, bg, wks.	ton	10.50 -	12.50
Bbl., wks.	ton	18.00 -	19.00
Lime, Lump, bbl.	280 lb.	3.63 -	3.65
Litharge, comm., casks	lb.	.10 -	.10½
Lithopone, bags	lb.	.06½-	.06¾
Magnesium carb., tech., bags	lb.	.08½-	.08½
Methanol, 95%, bbl.	gal.	.74 -	.76
Methanol, 97%, bbl.	gal.	.76 -	.78
Methanol, pure, tanks	gal.	.75 -	....
drums	gal.	.78 -	.80
bbl.	gal.	.83 -	.85
Methyl-acetone, t'ks.	gal.	.70 -	....
Nickel salt, double, bbl.	lb.	.09 -	.10½
Nickel salts, single, bbl.	lb	.10 -	.11
Orange mineral, csk	lb.	.13½-	.14½
Phosgene	....	.60 -	.75
Phosphorus, red, cases	lb.	.70 -	.75
Phosphorus, yellow, cases	lb.	.37½-	.40
Potassium bichromate, casks	lb.	.09 -	.09½
Potassium bromide, gran., bbl.	lb.	.25 -	.38
Potassium carbonate, 80-85%, calcined, casks	lb.	.05½-	.05½
Potassium chlorate, powd.	lb.	.07¾-	.08½
Potassium cyanide, drums	lb.	.47 -	.52
Potassium, first sorts, cask	lb.	.07¾-	.08
Potassium hydroxide (caustic potash) drums	lb.	.06½-	.06¾
Potassium iodide, cases	lb.	3.65 -	3.75
Potassium nitrate, bbl.	lb.	.06 -	.07½
Potassium permanganate, drums	lb.	.13¾-	.14
Potassium prussiate, red, casks	lb.	.35 -	.38
Potassium prussiate, yellow, casks	lb.	.18 -	.18½
Salammoniac, white, gran., casks, imported	lb.	.06¾-	.06½
Salammoniac, white, gran., bbl., domestic	lb.	.07½-	.08
Gray, gran., casks	lb.	.08 -	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk) works	ton	16.00 -	18.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 -	....
bags, contract	100 lb.	1.38 -	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 -	....
bags, contract	100 lb.	1.45 -	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 -	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 -	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	2.80 -	3.05
Sodium acetate, works, bbl.	lb.	.04½-	.05
Sodium bicarbonate, bulk	100 lb.	1.75 -	....
330-lb. bbl.	100 lb.	2.00 -	....
Sodium bichromate, casks	lb.	.07 -	.07½
Sodium bisulphate (niter cake)	ton	6.00 -	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½-	.04½
Sodium chlorate, kegs	lb.	.06½-	.07
Sodium chloride	long ton	12.00 -	13.00
Sodium cyanide, cases	lb.	.19 -	.22
Sodium fluoride, bbl.	lb.	$0.08½-	$0.09
Sodium hyposulphite, bbl.	lb.	.02¼-	.02½
Sodium nitrite, casks	lb.	.08½-	.09
Sodium peroxide, powd., cases	lb.	.23 -	.27
Sodium phosphate, dibasic, bbl.	lb.	.03½-	.03¾
Sodium prussiate, yel. bbl.	lb.	.09½-	.10½
Sodium salicylic, drums	lb.	.38 -	.40
Sodium silicate (40°, drums)	100 lb.	.75 -	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 -	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03½-	.03½
Sodium sulphite, crys., bbl.	lb.	.02½-	.03
Strontium nitrate, powd., bbl.	lb.	.09½-	.10
Sulphur chloride, yel drums.	lb.	.04½-	.05
Sulphur, crude	ton	18.00 -	20.00
At mine, bulk	ton	16.00 -	18.00
Sulphur, flour, bag	100 lb.	2.25 -	2.35
Sulphur, roll, bag	100 lb.	2.00 -	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 -	.08
Tin bichloride, bbl.	lb.	.14 -	.....
Tin oxide, bbl.	lb.	.52 -	.....
Tin crystals, bbl.	lb.	.35½-	.....
Zinc carbonate, bags	lb.	.12 -	.14
Zinc chloride, gran, bbl.	lb.	.06 -	.07½
Zinc cyanide, drums	lb.	.36½-	.37
Zinc dust, bbl	lb.	.08 -	.08½
Zinc oxide, lead free, bag	lb.	.07½-	.....
5% lead sulphate, bags	lb.	.06¾-	.....
10 to 35 % lead sulphate, bags	lb.	.06¾-	......
French, red seal, bags	lb.	.09¾-	......
French, green seal, bags	lb.	.10¾-	......
French, white seal, bbl	lb.	.11¾-	......
Zinc sulphate, bbl.	100 lb.	3.00 -	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 -	$0.65
Alpha-naphthol, ref., bbl.	lb.	.65 -	.75
Alpha-naphthylamine, bbl.	lb.	.35 -	.36
Aniline oil, drums	lb.	.16 -	.16½
Aniline salt, bbl.	lb.	.22 -	.23
Anthracene, 80%, drums	lb.	.70 -	.75
Anthraquinone, 25%, paste, drums	lb.	.75 -	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 -	.....
f.f.c. drums	lb.	1.60 -	.....
tech, drums	lb.	68	.72
Benzene, pure, water-white, tanks, works	gal.	.25 -	....
Benzene, 90%, tanks, works	gal.	.23 -	....
Benzidine base, bbl.	lb.	.80 -	.82
Benzidine sulphate, bbl.	lb.	.70 -	.72
Benzoic acid, U.S.P., kegs	lb.	.75 -	85
Benzoate of soda, U.S.P., bbl.	lb.	.65 -	.70
Benzyl chloride, 95-97%, ref. carboys	lb.	.35 -	....
Benzyl chloride, tech., drums	lb.	.25 -	....
Beta-naphthol, tech., bbl.	lb.	.24 -	.25
Beta-naphthylamine, tech.	lb.	.65 -	.70
Cresol, U.S.P., drums	lb.	.22 -	.26
Ortho-cresol, drums	lb.	.28 -	.32
Cresylic acid, 97%, works drums	gal.	.63 -	.65
95-97%, drums, works	gal.	.58 -	.60
Dichlorbenzene, drums	lb.	.07 -	.08
Diethylaniline, drums	lb.	.53 -	.58
Dimethylaniline, drums	lb.	.35 -	.37
Dinitrobenzene, bbl.	lb.	.15 -	.17
Dinitrochlorbenzene, bbl.	lb.	.21 -	.22
Dinitronaphthalen, bbl.	lb.	.30 -	.32
Dinitrophenol, bbl.	lb.	.35 -	.40
Dinitrotoluen, bbl.	lb.	.18 -	.20
Dip oil, 25%, drums	gal.	.26 -	.28
Diphenylamine, bbl.	lb.	.48 -	.50
H-acid, bbl.	lb.	.72 -	.75
Meta-phenylenediamine, bbl.	lb.	.95 -	1.00
Michlers ketone, bbl.	lb.	3.00 -	3.25
Monochlorbenzene, drums	lb.	.08 -	.10
Monoethylaniline, drums	lb.	1.20 -	1.30
Naphthalene, flake, bbl.	lb.	.04¾-	.05½
Naphthalene, balls, bbl.	lb.	.05¾-	.05½
Naphthionate of soda, bbl.	lb.	.60 -	.65
Naphthionic acid, crude, bbl.	lb.	.60 -	.62
Nitrobenzene, drums	lb.	.09 -	.09½
Nitro-naphthalene, bbl.	lb.	.25 -	.30
Nitro-toluene, drums	lb.	.13½-	.14
N-W acid, bbl.	lb.	.95 -	1.00
Ortho-amidophenol, kegs	lb.	2.40 -	2.50
Ortho-dichlorbenzene, drums	lb.	.12 -	.13
Ortho-nitrophenol, bbl.	lb.	.95 -	1.00
Ortho-nitrotoluene, drums	lb.	.11 -	.12
Ortho-toluidine, bbl.	lb.	.12 -	.13
Para-aminophenol, base, kegs	lb.	1.20 -	1.25
Para-aminophenol, HCl, kegs	lb.	1.30 -	1.40
Para-dichlorbenzene, bbl.	lb.	.17 -	20
Paranitraniline, bbl.	lb.	.68 -	.70
Para-nitrotoluene, bbl.	lb.	.50 -	.55
Para-phenylenediamine, bbl.	lb.	1.35 -	1.45
Para-toluidine, bbl	lb.	.72 -	.80
Phthalic anhydride, bbl.	lb.	.30 -	.34
Phenol, U.S.P., dr.	lb.	.24 -	.26
Picric acid, bbl.	lb.	.20 -	22
Pitch, tanks, works	ton	25.00 -	30.00
Pyridine, imp., drums	gal.	3.70 -	3.80
Resorcinol, tech., kegs	lb.	1.30 -	1.40

Resorcinol, pure, kegs	lb.	$2.00 - $2.[illegible]
R-salt, bbl	lb.	.50 - .55
Salicylic acid, tech., bbl	lb.	.32 - .33
Salicylic acid, U.S.P., bbl	lb.	.35 - ....
Solvent naphtha, water-white, tanks	gal.	.25 - ....
Crude, tanks	gal.	.22 - ....
Sulphanilic acid, crude, bbl	lb.	.16 - .18
Tolidine, bbl	lb.	1.00 - 1.05
Toluidine, mixed, kegs	lb.	.30 - .35
Toluene, tank cars, works	gal.	.26 - ....
Toluene, drums, works	gal.	.30 - ....
Xylidine, drums	lb.	.45 - .48
Xylene, 3 deg.-tanks	gal.	.40 - ....
Xylene, com., tanks	gal.	.28 - ....

Naval Stores

Rosin B-D, bbl	280 lb.	$5.60 - $5.65
Rosin E-I, bbl	280 lb.	5.70 - 5.75
Rosin K-N, bbl	280 lb.	5.95 - 6.20
Rosin W.G.-W.W., bbl	280 lb.	7.00 - 7.60
Wood rosin bbl	280 lb.	5.40 - 5.50
Turpentine, spirits of, bbl	gal.	.84 - ....
Wood, steam dist., bbl	gal.	.72 - ....
Wood, dest. dist., bbl	gal.	.54 - .55
Pine tar pitch, bbl	200 lb.	5.50 - ....
Tar, kiln burned, bbl	500 lb.	10.50 - ....
Retort tar, bbl	500 lb.	10.50 - ....
Rosin oil, first run, bbl	gal.	.38 - ....
Rosin oil, second run, bbl	gal.	.43 - ....
Rosin oil, third run, bbl	gal.	.48 - ....
Pine oil, steam dist.	gal.	.60 - ....
Pine tar oil, com'l	gal.	.30 - ....

Animal Oils and Fats

Degras, bbl	lb.	$0.03½ - $0.05½
Grease, yellow, loose	lb.	.07½ - .07¾
Lard oil, Extra No. 1, bbl	gal.	.83 - .84
Lard compound, bbl	lb.	.15½ - .15¾
Neatsfoot oil 20 deg. bbl	gal.	1.28 - ....
No. 1 bbl	gal.	.82 - .84
Oleo Stearine		.14½ - .15
Oleo oil, No. 1, bbl	lb.	.15 - ....
Red oil, distilled, d.p. bbl	lb.	.09 - .09½
Saponified bbl	lb.	.09 - .09½
Tallow, extra loose works	lb.	.08½ - ....
Tallow oil, acidless, bbl	gal.	.82½ - .83½

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.16½ - ......
Castor oil, No. 1, bbl	lb.	.17 - ......
Chinawood oil, bbl	lb.	.14½ - .15½
Coconut oil, Ceylon, bbl	lb.	.10½ - .10¾
Ceylon, tanks, N.Y.	lb.	.09½ - ......
Coconut oil, Cochin, bbl	lb.	.10½ - .11
Corn oil, crude, bbl	lb.	.13½ - .13¾
Crude, tanks, (f.o.b. mill)	lb.	.11½ - ......
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.11½ - .12
Summer yellow, bbl	lb.	.14½ - .15
Winter yellow, bbl	lb.	.15½ - .16
Linseed oil, raw, car lots, bbl.	gal.	1.00 - ......
Raw, tank cars (dom.)	gal.	.94 - ......
Boiled, cars, bbl. (dom.)	gal.	1.02 - ......
Olive oil, denatured, bbl	gal.	1.15 - 1.20
Sulphur, (foots) bbl	lb.	.09½ - .09¾
Palm, Lagos, casks	lb.	.08½ - .08¾
Niger, casks	lb.	.07½ - .08
Palm kernel, bbl	lb.	.09½ - ......
Peanut oil, crude, tanks (mill)	lb	.12½ - .13
Peanut oil, refined, bbl	lb.	.16 - .17
Perilla, bbl	lb.	.13 - .13½
Rapeseed oil, refined, bbl	gal.	.86 - ......
Sesame, bbl	lb.	.13 - .13½
Soya bean (Manchurian), bbl.	lb.	.11½ - .11¾
Tank, f.o.b. Pacific coast	lb.	.10½ - ......
Tank, (f.o.b. N.Y.)	lb.	.10½ - ......

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.58 - $0.60
Menhaden, light pressed, bbl.	gal.	.54 - ......
White bleached, bbl	gal.	.56 - ......
Blown, bbl	gal.	.60 - ......
Crude, tanks (f.o.b. factory)	gal.	.45 - ......
Whale No. 1 crude, tanks, coast	lb.	....
Winter, natural, bbl	gal.	.75 - .76
Winter, bleached, bbl	gal.	.78 - .79

Oil Cake and Meal

Coconut cake, bags	ton	$33.00 - 34.00
Cottonseed meal, f.o.b. mills	ton	43.00 - ......
Linseed cake, bags	ton	44.00 - ......
Linseed meal, bags, spot	ton	46.00 - ......

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.50 - $0.55
Albumen, egg, tech, kegs	lb.	.95 - .97
Cochineal, bags	lb.	.33 - .35
Cutch, Borneo bales	lb.	.04½ - .04¾
Cutch, Rangoon, bales	lb.	.13½ - .14½
Dextrine, corn, bags	100 lb.	4.32 - 4.37
Dextrine gum, bags	100 lb.	4.62 - 4.89
Divi-divi, bags	ton	40.00 - 42.00
Fustic, sticks	ton	30.00 - 35.00
Fustic, chips, bags	lb.	.04 - .05
Gambier com., bags	lb.	.12½ - .13
Logwood, sticks	ton	25.00 - 26.00
Logwood, chips, bags	lb.	.02½ - .03
Sumac, leaves, Sicily, bags	ton	125.00 - 130.00
Sumac, ground, bags	ton	123.00 - ......
Sumac, domestic, bags	ton	50.00 - 55.00
Starch, corn, bags	100 lb.	3.67 - 3.94
Tapioca flour, bags	lb.	.04½ - .06

Extracts

Archil, conc., bbl	lb.	$0.16 - $0.19
Chestnut, 25% tannin, tanks.	lb.	.01½ - .02
Divi-divi, 25% tannin, bbl	lb.	.05 - .05½
Fustic, crystals, bbl	lb.	.20 - .22
Fustic, liquid, 42°, bbl	lb.	.08 - .09
Gambier, liq., 25% tannin, bbl.	lb.	.11 - .11½
Hematine crys., bbl	lb.	.14 - .18
Hemlock, 25% tannin, bbl	lb.	.03½ - .04
Hypernic, solid, drums	lb.	.22 - .24
Hypernic, liquid, 51°, bbl	lb.	.12 - .13
Logwood, crys., bbl	lb.	.14 - .15
Logwood, liq., 51°, bbl	lb.	.07½ - .08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 - .08
Osage Orange, powder, bg	lb.	.14 - .15
Quebracho, solid, 65% tannin, bbl	lb.	.04½ - .04¾
Sumac, dom., 51°, bbl	lb.	.06½ - .06¾

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, contract	lb.	$0.09 - $0.11
spot, cases	lb.	.12 - .16
Lampblack, bbl	lb.	.12 - .40
Mineral, bulk	ton	35.00 - 45.00
Blues-Bronze, bbl	lb.	.36 - .38
Prussian, bbl	lb.	.36 - .38
Ultramarine, bbl	lb.	.07 - .35
Browns, Sienna, Ital., bbl	lb.	.05 - .12
Sienna, Domestic, bbl	lb.	.03 - .03½
Umber, Turkey, bbl	lb.	.04 - .04½
Greens-Chrome, C.P. Light, bbl	lb.	.28 - .30
Chrome, commercial, bbl	lb.	.11½ - .12
Paris, bulk	lb.	.24 - .26
Reds, Carmine No. 40, tins	lb.	4.25 - 4.50
Iron oxide red, casks	lb.	.08 - .12
Para toner, kegs	lb.	.95 - 1.00
Vermilion, English, bbl	lb.	1.25 - 1.30
Yellow, Chrome, C.P. bbls	lb.	.17 - .17½
Ocher, French, casks	lb.	.02 - .03

Waxes

Bayberry, bbl	lb.	$0.21 - $0.21½
Beeswax, crude, Afr. bg	lb.	.25 - .26
Beeswax, refined, light, bags	lb.	.32 - .34
Beeswax, pure white, cases	lb.	.40 - .41
Candellila, bags	lb.	.23 - .23½
Carnauba, No. 1, bags	lb.	.36 - .37
No. 2, North Country, bags	lb.	.28 - .29
No. 3, North Country, bags	lb.	.21 - .22
Japan, cases	lb.	.18½ - .19
Montan, crude, bags	lb.	.05¾ - .06
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.05½ - ....
Crude, scale 124-126 m.p. bags	lb.	.04¾ - .05
Ref., 118-120 m.p., bags	lb.	.05¾ - ....
Ref., 123-125 m.p., bags	lb.	.05½ - ....
Ref, 128-130 m.p., bags	lb.	.05¾ - ....
Ref., 133-135 m.p., bags	lb.	.06¾ - .07
Ref., 135-137 m.p., bags	lb.	.07¼ - .07½
Stearic acid, sgle pressed, bags	lb.	.10½ - ....
Double pressed, bags	lb.	.11½ - ....
Triple pressed, bags	lb.	.12½ - ....

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50 - $7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.40 - 2.45
Blood, dried, bulk	unit	4.10 - 4.15
Bone, raw, 3 and 50, ground	ton	26.00 - 28.00
Fish scrap, dom., dried, wks.	unit	3.35 - 3.40
Nitrate of soda, bags	100 lb.	2.45 - ....
Tankage, high grade, f.o.b. Chicago	unit	2.50 - ....
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.25 - 3.70
Tennessee, 75%	ton	6.75 - 7.00
Potassium muriate, 80%, bags	ton	34.55 - ....
Potassium sulphate, bags basis 90%	ton	45.85 - ....
Double manure salt	ton	26.35 - ....
Kainit	ton	7.22 - ....

Crude Rubber

Para—Upriver fine	lb.	$0.23½ - ....
Upriver coarse	lb.	.16½ - ....
Upriver caucho ball	lb.	.16 - ....
Plantation—First latex crepe	lb.	.24¾ - ....
Ribbed smoked sheets	lb.	.23¾ - ....
Amber crepe No. 1	lb.	.23½ - ....

Gums

Copal, Congo, amber, bags	lb.	$0.09 - $0.14
East Indian, bold, bags	lb.	.13 - .14
Manila, pale, bags	lb.	.18 - .19
Pontinak, No. 1 bags	lb.	.19 - .20
Damar, Batavia, cases	lb.	.23 - .23½
Singapore, No. 1, cases	lb.	.26 - .26½
Singapore, No. 2, cases	lb.	.18 - .18½
Kauri, No. 1, cases	lb	.58 - .64
Ordinary chips, cases	lb.	.21 - .22
Manjak, Barbados, bags	lb.	.06 - .09

Shellac

Shellac, orange fine, bags	lb.	$0.54 - $0.55
Orange superfine, bags	lb.	.56 - .57
A. C. garnet, bags	lb.	.52 - ....
Bleached, bonedry	lb.	.63 - .64
Bleached, fresh	lb.	.52 - .53
T. N., bags	lb.	.52 - .53

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$300.00 - $400.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	50.00 - 70.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 - 25.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	16.00 - 17.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00 - 14.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	23.00 - 24.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00 - 9.00
Casein, bbl., tech	lb.	.11 - .12
China clay (kaolin) crude, No. 1, f.o.b. Ga	net ton	7.00 - 8.00
Washed, f.o.b. Ga	net ton	8.50 - 9.00
Powd., f.o.b. Ga	net ton	14.00 - 20.00
Crude f.o.b. Va	net ton	6.00 - 8.00
Ground, f.o.b. Va	net ton	13.00 - 19.00
Imp., lump, bulk	net ton	15.00 - 20.00
Imp., powd	net ton	45.00 - 50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	7.00 - 7.50
No. 2 f.o.b. N.C.	long ton	4.50 - 5.00
No. 1 gr'd. N. C.	long ton	15.32 - 21.00
No. 1 Canadian, f.o.b. mill, powd	long ton	20.00 - ....
Graphite, Ceylon, lump, first quality, bbl	lb.	.05¾ - .06
Ceylon, chip, bbl	lb.	.04¾ - .05
High grade amorphous crude	ton	15.00 - 35.00
Gum arabic, amber, sorts, bags	lb.	.11½ - .11¾
Gum tragacanth, sorts, bags	lb.	.50 - .51
No. 1, bags	lb.	1.20 - ....
Kieselguhr, f.o.b. Cal	ton	40.00 - 42.00
F.o.b. N.Y.	ton	50.00 - 55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00 - 45.00
Pumice stone, imp., casks	lb.	.03 - .40
Dom., lump, bbl	lb.	.06 - .08
Dom., ground, bbl	lb.	.03 - .05
Silica, glass sand, f.o.b. Ind	ton	2.00 - 2.50
Silica, sand blast, f.o.b. Ind	ton	2.25 3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 - ....
Silica, glass sand, f.o.b. Ill.	ton	2.00 - 2.50
Soapstone, coarse, f.o.b. Vt., bags	ton	7.50 - 8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 - ....
Talc, 200 mesh, f.o.b. Ga., bags	ton	8.00 - 10.00
Talc, 325 mesh, f.o.b. New York, grade A bags	ton	14.75 - ....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.00 - $3.25
Corning	bbl.	1.80 - ......
Cabell	bbl.	1.60 - ......
Somerset	bbl.	1.70 - ......
Illinois	bbl.	1.97 - ......
Indiana	bbl.	1.98 - ......
Kansas and Okla. under 28 deg.	bbl.	.90 - ......
California, 35 deg. and up	bbl.	1.40 - ......

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.19 - ......
Naphtha, V. M. & P. deod, steel bbls	gal	.18 - ......
Kerosene, ref. tank wagon	gal.	.13 - ......
Bulk, W.W. delivered, N.Y.	gal.	.07½ - .07¾
Lubricating oils:		
Cylinder, Penn., filtered	gal.	.30 - .35
Bloomless, 30@31 grav	gal.	.21 - .22
Paraffin, pale 885 vis	gal.	.16 - .17
Spindle, 200, pale	gal.	.22 - ....
Petrolatum, amber, bbls	lb.	.04 - .04½
Paraffine wax (see waxes)		

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140-$145
Chrome brick, f.o.b. Eastern shipping points	ton	45-47
Chrome cement, 40-50% Cr_2O_3	ton	23-27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks	1,000	40-43
2nd. quality, 9-in. shapes, f.o.b. wks	1,000	33-38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65-68
9-in. arches, wedges and keys	ton	80-85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48-50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48-50
F.o.b. Mt. Union, Pa	1,000	36-38
Silicon carbide refract. brick, 9-in.	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 - ......

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30 –	....
4-6% C	lb.	.11½–	....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr.ton	105.00 –	....
Spiegeleisen, 19-21% Mn.	gr.ton	35.00 –	36.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.25
Ferrosilicon, 10-12%	gr. ton	39.50 –	43.50
50%	gr. ton	75.00 –	.....
Ferrotungsten, 70-80%, per lb. of W	lb.	.90 –	.93
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 –	....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 –	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3.	ton	22.00 –	....
C.i.f. Atlantic seaboard	ton	19.00 –	22.00
Coke, fdry., f.o.b. ovens	ton	4.25 –	4.50
Coke, furnace, f.o.b. ovens	ton	3.00 –	3.25
Fluorspar, gravel, f.o.b. mines, Illinois	ton	23.50 –	....
Ilmenite, 52% TiO_2 Va.	lb.	.01½–	....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.42 –	.46
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.80 –	....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	....
Rutile, 94@96% TiO_2	lb.	.12 –	.15
Tungsten, scheelite, 60% WO_3 and over	unit	9.25 –	....
Tungsten, wolframite, white, 60% WO_3	unit	9.00 –	9.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	12.50
Vanadium pentoxide, 99%	lb.	2.00 –	4.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13 – .13½
Aluminum, 98 to 99%	lb.	.26½– .28
Antimony, wholesale, Chinese and Japanese	lb.	.08¼– .....
Nickel, 99%	lb.	.27 – .30
Monel metal, shot and blocks	lb.	.32
Tin, 5-ton lots, Straits	lb.	.49¼
Lead, New York, spot	lb.	.07¼
Lead, E. St. Louis, spot	lb.	.0740
Zinc, spot, New York	lb.	.0637½
Zinc, spot, E. St. Louis	lb.	.06025
Silver (commercial)	oz.	.68¼
Cadmium	lb.	.60
Bismuth (508 lb. lots)	lb.	2.40
Cobalt	lb.	2.50-3.00
Magnesium, ingots, 99%	lb.	.90-.95
Platinum, refined	oz.	120.00
Iridium	oz.	260.00-270.00
Palladium, refined	oz.	78.00-83.00
Mercury	75 lb.	71.00-71.50
Tungsten powder	lb.	.95-1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.25
Copper bottoms	28.75
Copper rods	19.75
High brass rods	16.75
High brass rods	14.00
Low brass wire	18.50
Low brass rods	19.50
Brazed bronze tubing	23.75
Seamless copper tubing	21.75
Seamless high brass tubing	20.50

OLD METALS—The following are the dealers purchasing prices in cents per pound:

Copper, heavy and crucible	9.50 @ 9.75
Copper, heavy and wire	9.25 @ 9.37½
Copper, light and bottoms	7.50 @ 7.75
Lead, heavy	6.00 @ 6.12½
Lead, tea	3.50 @ 3.62½
Brass, heavy	4.75 @ 5.00
Brass, light	4.00 @ 4.25
No. 1 yellow brass turnings	6.00 @ 6.25
Zinc scrap	3.37½ @ 3.50

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.44	$3.44
Soft steel bars	3.34	3.34
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.09	4.09
Plates, ¼ to 1 in. thick	3.44	3.44

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arkansas

HIGH POINT—Nature's Mineral Products Co., Natural Park, Hot Springs, Ark., has plans under consideration for enlargements in its tripoli works at High Point, to include the installation of additional equipment for the development of tripoli deposits and reduction machinery for commercial production. The company has recently taken out a state charter with capital of $100,000, and plans for early increase in capitalization to $200,000. J. A. Lowrance is president, and C. C. Mix, general manager.

California

BURBANK—The Soda & Potash Co., Loew State Bldg., Los Angeles, has plans under way for the erection of a new plant on site acquired on Sonora Street, Burbank, to consist of a main 1-story unit, 100x150 ft., with power house adjoining, estimated to cost $100,000, with machinery. A list of equipment to be installed, including evaporators, filters, high pressure piping and reduction machinery, will be arranged at an early date. The Kennard Engineering Co., Hollingsworth Bldg., Los Angeles, is engineer. C. W. Berry is president.

NAPA—The Basalt Rock Co., has work in progress on a new plant in the vicinity of Napa, estimated to cost $150,000, including machinery. It is expected to place the initial unit in service at an early date.

Connecticut

HAMDEN—The United Smelting & Aluminum Co. is said to have preliminary plans under advisement for the rebuilding of the portion of its plant, destroyed by fire, July 22, with loss estimated at $100,000, including machinery. The fire started in the chemical laboratory at the plant, and caused considerable damage in this department.

Florida

PALMETTO—The Kill-Rust Corp., recently organized, contemplates the operation of a local plant for the manufacture of special chemical preparations. F. Nelson Stevenson, Palmetto, is secretary.

Georgia

ATLANTA—Bids will be received by W. P. Price, 147 Peoples St., city purchasing agent until Aug. 21, for the installation of a chemical house and mixing chamber at the municipal waterworks. W. Z. Smith, 442 Luckie St., is city manager.

Maryland

BALTIMORE—The Aluminum Co. of America, Inc., Oliver Bldg., Pittsburgh, Pa., is reported to be planning for the completion of its plant in the Sollers Point section, on which work was started a number of years ago and approximately $1,000,000 expended, with the project later held in abeyance. The company has a tract of 400 acres of land at this location and purposes to establish a works for initial treatment of the raw product as received from company mines, later to be refined at present plants at Niagara Falls and Massena, N. Y., New Kensington, Pa., and other localities. The completion work will consist of additional buildings and equipment, estimated to cost close to $2,500,000.

BALTIMORE—The Locke Insulator Corp., Charles and Cromwell Sts., manufacturer of high-tension porcelain insulators for electrical service, has filed plans for a 1-story addition, for which a general contract has been awarded to J. Henry Miller, Inc., 742 North Eutaw St. Parker, Thomas & Rice, Union Trust Bldg., are architects.

Massachusetts

BOSTON—The Tileston & Hollingsworth Co., 49 Federal St., manufacturer of paper products, has awarded a general contract to the Morton C. Tuttle Co., Park Square Bldg., for the construction of two additions to its mills in the Hyde Park district, consisting of a 4-story beater house and 3-story structure for general operating service, to cost in excess of $75,000. George F. Hardy, 309 Broadway, New York, is architect and engineer.

FITCHBURG—The Crocker-Burbank Co., 545 Westminster St., manufacturer of paper products, has foundations in progress for a new 2-story building for general operating service, estimated to cost $32,000. A general contract for the extension has been awarded to Wiley & Foss, Central St., Fitchburg.

Michigan

MUSKEGON — The Brunswick-Balke-Collender Co., 629 South Wabash Ave., Chicago, manufacturer of billiard tables, cabinets, etc., is planning for the erection of an addition to its local plant, to be used for the manufacture of varnish, oils, etc., for use at the other factories of the company. The initial unit will be of five-kettle type.

Missouri

KANSAS CITY—The Western Boiler Compound Co., 306 Delaware Ave., has awarded a general contract to Carl A. Brand, Sharp Bldg., for the erection of its proposed 1½-story plant at 713-15 Washington St., for which foundations will be laid at once. George W. Swehla, Westport Bank Bldg., is architect. M. L. Frisher is head.

New Jersey

WHIPPANY—The Agar Mfg. Corp., 167 41st St., Brooklyn, N. Y., manufacturer of corrugated fiber containers, etc., has work in progress on its proposed local mill, for which a tract of property was secured a number of months ago. The main unit will be 230x400 ft., equipped to give employment to about 165 operatives. A power house will be built. It is expected to have the plant ready for service at an early date.

RUTHERFORD — The Anaconda Copper Mining Co., 25 Broadway, New York, has awarded a general contract to the Walter Kidde Co., 90 West St., New York, for the erection of a 1-story plant at Rutherford, to be equipped as an electroplating works. It will be 80x260 ft., estimated to cost about $75,000, including machinery. Foundations will be laid immediately.

ROCKAWAY—The North Jersey Ore & Concentrating Co. has taken over the local plant and mining properties of the North Jersey Steel Co., including the Beach Glen iron ore mine. Plans are under advisement for extensions and betterments, with equipment for increase in capacity.

New York

SARATOGA SPRINGS—The Iroquois Pulp & Paper Co. will make enlargements in its mills and install additional equipment, primarily for increase in pulp production. A contract for grinders has been awarded to the Bath Iron Works, Bath, Me., and other orders will be placed, it is said, in the near future.

UTICA—A 1-story foundry for the production of iron and steel castings will be erected by the Munson Mill Machinery Co., Broadway, in connection with a number of other plant extensions, estimated to cost, in all, $500,000, including equipment. A general contract for the construction has been let to Lyons Brothers, Lyons Mills, Solsville, N. Y. Charles Kiehm, Gardner Bldg., is architect.

SENECA FALLS—The J. H. Lowe Chemical Mfg. Co. is said to be planning for the rebuilding of the portion of its plant on the Seneca Falls-Auburn Highway, recently destroyed by fire with loss reported at $14,000, including equipment.

DUNKIRK—Creditors of the Atlas Crucible Steel Co. are arranging plans for the formation of a new company, with capital of $2,500,000, and closely similar name, to acquire the plant at a forthcoming foreclosure sale, now slated to be held early in the fall. Improvements and machinery repairs will be made, and the works placed in operation shortly thereafter. The new Atlas company will be headed by A. F.

Dohn, Dunkirk, for a number of years connected with the former organization.

BUFFALO—The Pratt & Letchworth Co., 189 Tonawanda St., manufacturer of steel and malleable-iron castings, has filed plans for a 1-story foundry addition, estimated to cost $40,000, for which erection will proceed at once.

North Carolina

CHARLOTTE—The Carolina Standard Gas Products Co., Charlotte, has awarded a general contract to B. W. Bartholomew, Piedmont Bldg., for the erection of the first unit of its proposed plant on South Clarkson St., for the manufacture of hydrogen products, to be 1-story, 55x90 ft. Philip W. Wilcox is president.

WILMINGTON — The Swift Fertilizer Works, Inc., has commenced extensions and improvements at its plant to cost in excess of $80,000, including equipment. A portion of the fund will be used for expansion in the picric acid department.

Ohio

MASSILLON—The Central Furnace Co., a subsidiary of the Central Steel Co., will soon award contracts for the construction of its proposed new blast furnace and by-products coke plant, for which plans are nearing completion. The works will cost upward of $5,000,000, with equipment, and are expected to give employment to more than 4,000 men. The plant will be ready for service in about 12 months. C. E. Stuart is secretary-treasurer of the parent company.

Oklahoma

TULSA—M. C. Bredahl, 808 Mid-Continent Bldg., is said to be planning for the organization of a company to construct and operate a local plant for the manufacture of cleaning compounds, using pumice as one of the basic materials. The initial works are expected to cost about $25,000, with equipment.

KUSA—The Kusa Brick & Tile Co., has work in progress on extensions at its plant for the manufacture of hollow tile products. Considerable additional equipment will be installed.

OKLAHOMA CITY—The Red Seal Refining Corp. is reported to have concluded arrangements for the purchase of the local Chaote oil refinery and will take immediate possession. Plans are under consideration for extensions and improvements, including the installation of additional equipment, estimated to cost $150,000.

Pennsylvania

PHILADELPHIA — The Philadelphia & Reading Railway Co., Reading Terminal, has awarded a general contract to the Bentley-Morrison Corp., 223 Grove St., Elizabeth, N. J., for the construction of a new creosoting plant in the Port Richmond section, to be used for tie and other wood preservative work.

YORK—The Gilbert Wall Paper Co., 7 South Linden Ave., has awarded a general contract to Samuel P. Fladfelter, Small Bldg., for the erection of a 2-story and basement mill at State St. and the Pennsylvania Railroad. A 1-story power house will also be built. J. A. Dempwolf, Casset Bldg., is architect. Paul C. Gilbert is president.

NEW CASTLE—Following the completion of a 50-ton open-hearth furnace at its local plant, the Penn Seaboard Steel Corp., Franklin Bank Bldg., Philadelphia, has commenced the construction of another such unit and has plans under way for the building of a third open-hearth furnace at a later date. Other extensions and improvements will be made at the works for considerable increase in output.

South Carolina

CHARLESTON—The Carolina Lime & Phosphate Co., 199 Meeting St., has leased phosphate rock properties of the Charleston Mining & Mfg. Co., in the Ashley River section. Plans are under way for extensive development work for commercial production, including the installation of additional equipment. William A. Hutchinson is head.

Tennessee

NASHVILLE—The Nashville Pottery Co., 960 Cleveland St., will soon begin the construction of a 1-story plant on local site, 140x150 ft., to be used in connection with the removal of its works from McKenzie, Tenn. Additional equipment will be installed, for which a number of contracts are being let, to be used for expansion in the present line of pottery products.

Texas

DALLAS—The Blue Diamond Co. has awarded a general contract to the Herbst Construction Co., Melba Bldg., for the erection of a 1-story plant for mortar and mortar color mixing and distribution. The machinery installation is estimated to cost about $23,000.

HOUSTON—In connection with its proposed phosphate and fertilizer works on site on the ship channel, the Texas Chemical Co., Houston, is projecting plans for the erection of another plant in the vicinity of Baton Rouge, La., to be used primarily for the production of muriatic acid and affiliated specialties. It is estimated to cost more than $150,000, with machinery.

ATHENS—The Athens Pottery Co. is said to have preliminary plans under advisement for the construction of a new plant at Houston, Tex., for the manufacture of flower pots and similar pottery specialties. It is purposed to begin work at an early date. M. K. Miller is secretary.

Virginia

COVINGTON—The West Virginia Pulp & Paper Corp., 200 5th Ave., New York, has awarded a general contract to the Morton C. Tuttle Co., Park Square Bldg., for the erection of a number of additions to its local mill, including improvements in the existing works. Considerable equipment will be installed.

RICHMOND—The Economy Concrete Co., has let a contract to the Richmond Structural Steel Co., 17th and Dock Sts., for the erection of a new producing and mixing plant, 100x100 ft. Electric-operated conveyors and other equipment will be installed.

New Companies

EWEN TILE MFG. CORP., New Brunswick, N. J.; ceramic tile and kindred products; $300,000. Incorporators: William A. Harrison, George A. Morrison and Benjamin W. Jennings. The registered office is at 390 George St., New Brunswick.

GREAT NORTHERN OIL, INC., Denver, Col.; petroleum products; $500,000. Incorporators: C. H. Weaver, C. Anderson and W. I. Dukes. Representative: C. R. Enos, 704 United States National Bank Bldg., Denver.

BLUE LINE CHEMICAL CO., St. Louis, Mo.; chemicals and chemical byproducts; $50,000. Incorporators: W. A. Adams, T. F. Guthrie and I. W. Kurtz, 3853 Castleman St. The last noted is representative.

R. C. CARMIEN CORP., Brooklyn, N. Y.; paints, varnishes, etc.; $50,000 and 100 shares common stock, no par value. Incorporators: R. C. Carmien, H. W. Torney and B. C. Sprague. Representative: S. V. Ryan, Albany, N. Y., attorney.

AGATE FOUNDRIES, INC., 1721-25 Park Ave., Chicago, Ill.; iron and steel castings, etc.; $25,000. Incorporators: Paul Wachtel, J. P. and D. H. Brownlee.

SCHAUMAN WOOD PRESERVING CO., New Orleans, La.; wood preservatives, creosote specialties; capital not stated. Incorporators: A. Griffiria and James H. Kennedy, 1829 Religious St., New Orleans.

DIP CORP., New York, N. Y., care of the United States Corporation Co., 65 Cedar St., New York, representative; soap powders, washing compounds, etc.; $2,000,000. Incorporators: Arthur H. Haaren, New York; Leo C. Fennelly, Brooklyn; and Walter A. Peterson, Bloomfield, N. J.

ENDURANCE PAINT CO., Los Angeles, Calif.; paints, varnishes, etc.; $25,000. Incorporators: D. F. A. Welsh, Santa Monica, Calif.; and L. P. Streeter, Glendale, Calif.

CENTRAL STATE OIL CO., Denver, Colo.; petroleum products; $100,000. Incorporators: D. Heaton and E. Campbell. Representative: L. Champiose, 1010 Patterson Bldg., Denver.

MOTHPROOFING SPECIALTY CO., 540 Hearst Tower Bldg., Baltimore, Md.; chemical specialties, camphor products, etc.; $100,000. Incorporators: George W. Stevenson, Raymond A. White and William J. Zimmisch.

LAKESIDE CHEMICAL CORP., Rochester, N. Y.; chemicals and chemical byproducts 200 shares of stock, no par value. Incorporators: B. M. Sweet and M. J. Merville. Representative: R. L. Richardson, Fillmore, N. Y., attorney.

SWORDS BROTHERS OIL CO., 1120 West Washington St., East Peoria, Ill.; refined oils; $25,000. Incorporators: William, Elmer and Chester Swords.

METALS REFINING CO., Augusta, Me.; operating a smelting and refining plant; $2,000,000. Incorporators: Ernest L. McLean, Sanford L. Fogg, E. N. Leavitt and E. F. Porter, all of Augusta.

EUREKA PRESSED CEMENT BRICK CO., INC., 812 Hollins St., Baltimore, Mw.; concrete and cement bricks, blocks, etc.; $100,000. Incorporators: John T. Goldwine and Levi A. Thompson.

LAKEVILLE SALT CO., INC., Philadelphia, Pa., care of the Corporation Guarantee & Trust Co., Land Title Bldg., Philadelphia, representative; operate salt mines and reduction plants for commercial production; $700,000.

DADE BROTHERS MFG. CO., Garden City, L. I.; title products; $10,000. Incorporators: J. E. Dade, J. M. Rudiger and T. V. Bosch. Representative: Seabury, Seaman & Gehrig, Hempstead, L. I., attorneys.

HOLT OIL CO., Federalsburg, Md.; oils, greases, etc.; $10,000. Incorporators: P. Jefferson, J. R. MacSorley and C. E. Turner, all of Federalsburg.

NIAGARA PETROLEUM CO., Westfield, Ill.; petroleum and petroleum byproducts; $20,000. Incorporators: Nathan R. and Clarence E. Bennett, both of Westfield.

HALZER CO., St. Louis, Mo.; chemical specialties; $20,000. Incorporators: Christian G. Bell, Robert E. Hastings, and William I. Deltzer, 512 Lucas Ave., St. Louis.

BIDTEL'S MFG. CO., Drakes Lane and Orange Place, Irvington, Newark, N. J.; chemical products; $25,000. Incorporators: Ernest A., Gustav J., and M. E. Birtel.

KAY CHEMICAL CORP., New York, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: G. Adelman, J. Levy and J. R. Margulies. Representative: Adelman & Levine, 1650 Broadway, New York..

PREMIER OIL CORP., Fort Worth, Tex.; refined petroleum products; $100,000. Incorporators: C. F. Greenwood, H. D. Oglesby and W. H. Tolbert, all of Fort Worth.

BATES CHEMICAL CO., care of the Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del.; chemicals and chemical byproducts; $150,000.

LUZERNE PAPER CORP., New York, N. Y.; 1,000 shares of stock, no par value; paper products. Incorporators: M. R. O'Shaughnessy, H. A. McEntee and S. Brown. Representative: Leo Oppenheimer, 60 Wall St., New York..

BARTON TORPEDO CO., Tulsa, Okla.; explosives; $100,000. Incorporators: R. P. Barton, H. D. Streattor and J. D. Singley, 2701 East 9th St., Tulsa.

EVERLAST HEEL & RUBBER CORP., care of the United States Corporation Co., Dover, Del., representative; rubber products; $200,000.

Industrial Notes

THE LAKESIDE CHEMICAL CO. has been organized and incorporated at Rochester, N. Y., by Ransom L. Richardson, Bruce M. Sweet and Milford J. Merville, of Fillmore, N. Y., to manufacture and deal in commercial and industrial chemicals.

THE LINK-BELT CO., Chicago, Ill., announces the following changes in organization, adopted by the Board of Directors July 24. The Chairman of the Board was made the chief executive officer of the Company, and an Executive Committee of four was created to act in an advisory capacity to the officers. Mr. Piez was elected Chairman of the Board and Chairman of the Executive Committee; Alfred Kauffman, newly elected President, Staunton B. Peck, Senior Vice-President, and Thomas B. Marston, a member of the Board of Directors, were selected as the three other members of the Executive Committee.

Alfred Kauffman, Second Vice-President of the Company, was elected President, and Mr. Piez, Chairman of the Board, delegated to him the general direction and supervision of operations and sales.

Staunton B. Peck, as Senior Vice-President, directs and supervises operations and sales in the Eastern District; Arthur C. Johnson, elected to the position of Second Vice-President, remains in charge of operations and sales in the Western district, and Humphrey J. Kiely, newly elected Third Vice-President, continues in charge of exports and sales in the New York district.